DOCUMENT RESUME

ED 171 497 RC 011 428

TITLE A Procedures Manual for Assessing the Socioeconomic Impact of the Construction and Operation of Coal Utilization Facilities in the Old West Region.
INSTITUTION Booz Allen and Hamilton, Inc., Washington, D.C.
SPONS AGENCY Old West Regional Commission, Billings, Mont.
PUB DATE 74
NOTE 463p.
AVAILABLE FROM National Technical Information Service, PB 288164/AC, Springfield, Virginia 22161 (HC $11.75, MF $3.00)

EDRS PRICE MF01/PC19 Plus Postage.
DESCRIPTORS Community Development; Costs; *Economic Development; Employment; Facilities; Financial Support; *Government Role; Housing; Income; *Industrialization; Natural Resources; Population Trends; *Program Design; Quality of Life; Rural Development; Schools; *Socioeconomic Influences
IDENTIFIERS Coal Mining; *Energy Development; *Impact Studies

ABSTRACT

To assure that development of coal utilization facilities in the sparsely populated Old West Region of Montana, Nebraska, North Dakota, South Dakota, and Wyoming will proceed in an orderly manner with a minimum of socioeconomic disruption or fiscal inequality, impact studies must be prepared for each of the 100 potential sites to be affected. Categories to be included in each study are: sociological impacts, such as changes in population characteristics; economic impacts, including the creation of new employment and income; capital costs for infrastructure, housing, public facilities and commercial facilities; public operating costs for county, municipal and school functions; potential revenues to cover public capital and operating costs; cost/revenue analysis for public operations; and impacts on existing industry. Impacts are to be projected over approximately 30 years, covering the construction, steady-state operating and shut-down phases. This manual provides standardized procedures for those preparing impact analyses which will assure completeness and comparability of all reports. Sample data forms, tables, graphs, charts and formulae comprise a major portion of the manual. (NEC)

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RC011428

A PROCEDURES MANUAL

FOR ASSESSING THE SOCIOECONOMIC IMPACT OF THE CONSTRUCTION AND OPERATION OF COAL UTILIZATION FACILITIES IN THE OLD WEST REGION

FOR THE

OLD WEST REGIONAL COMMISSION

BOOZ, ALLEN & HAMILTON INC.
WASHINGTON, D.C.

1974

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A. INTERVIEWS

B. LIST OF FORMULAE

I. INTRODUCTION

The Old West Region--consisting of the states of Montana, Nebraska, North Dakota, South Dakota and Wyoming--is the site of the Fort Union Formation, which accounts for 40% of the total United States coal resources, and as much as 73% of the low sulfur resources. Low cost, non-polluting energy is becoming an increasingly scarce resource in this country. The recent "energy crisis" has just highlighted the conflict between increasing demand and dwindling resources.

1. COAL RESERVES IN THE OLD WEST HAVE BEEN ESTIMATED TO BE 1.3 TRILLION TONS

Present price and technology factors indicate that more than 60 billion tons of these resources are economically feasible to mine. Virtually all the production is expected to be from surface or "strip" mines because of the low depth of overburden.

The Fort Union Formation covers primarily the southeastern portion of Montana, northeastern Wyoming, and southwestern North Dakota. Part of the formation extends into South Dakota, but no major resources are known in Nebraska.

2. PLANS HAVE BEEN MADE FOR THE EXTENSIVE DEVELOPMENT OF THE COAL RESOURCES OF THE OLD WEST REGION

Several scenarios of potential development by private corporations have been made by the Northern Great Plains Resources Program. The extensive development forecast projects the following potential facilities:

	Montana	North Dakota	Wyoming	Total
Coal gasification plants	15	17	9	41
Power generation plants	4	6	1	11
Mining for export	22	2	24	48
Total	41	25	34	100

Already additional sites have been identified by applicant companies. In addition, coal liquification plants are a possibility within the region. Finally, each coal gasification and power generated facility will have its own mine.

These 100 potential sites for the utilization of coal are tentatively plotted in five counties and two Indian Reservations in Montana, eight counties in North Dakota, and four counties in Wyoming.

3. COAL-RELATED DEVELOPMENTS WILL HAVE A DRAMATIC IMPACT ON THE SOCIAL AND ECONOMIC STRUCTURE OF THESE COUNTIES AND STATES

A single coal gasification plant, with its attendant mining operation, can create 800 to 1,000 basic jobs in a community, introducing additional secondary employment and adding many thousands of persons to the local community.

None of the counties of potential development had over 20,000 population in 1970. Most cities near a potential site had populations in the range of 800 to 8,000 persons.

The present economic structure is based primarily on agriculture and oil/gas production. For much of the region, population has declined during the past few decades, resulting in reduced business activity and loss of job opportunities for present residents.

4. THE PURPOSE OF THIS ASSIGNMENT IS TO DEVELOP A PROCEDURES MANUAL FOR ESTIMATING THE SOCIOECONOMIC IMPACT ON A LOCAL COMMUNITY FROM COAL-UTILIZATION FACILITIES

The governors of the five concerned states--as members of the Old West Regional Commission--wish to assure that the development of the coal-utilization industry will proceed in an orderly manner with minimal socioeconomic disruption or fiscal inequality. To gather the necessary information on the costs and revenues of local public expenditures, both capital and operating, a socioeconomic impact study should be prepared for each proposed facility and local community to be affected.

In order to complete studies within a short time schedule, to obtain fuller awareness of local conditions and to provide experience in impact studies, the Commission will retain research individuals and organizations from within the Old West Region to prepare the impact studies. Under normal conditions, each study would so reflect the local situation and researchers orientation that the studies would not necessarily be comprehensive or comparable. It is essential, as the states, Federal government, local communities and applicant companies consider these impacts, that each study have the following characteristics:

- Be comprehensive in the social and economic impacts to be considered
- Include all the same impacts so that totals will be comparable
- Use consistent assumptions, clearly stated
- Be clear and precise to assure easy and timely completion
- Provide a standard methodology to eliminate researcher's need to create one
- Provide state and local governments and applicant companies with clear, precise data requirements

A list of individuals and organizations contacted is included in Appendix A. These persons are available as resources to the individual researcher. Their assistance in this study is greatly appreciated.

6. THE SCOPE OF THE ANALYSES COVERS LOCAL SOCIOECONOMIC IMPACTS AND PUBLIC COSTS

The procedures manual will provide as products the following categories of impacts:

- Sociological impacts, such as changes in population characteristics
- Economic impacts, including the creation of new employment and income
- Capital costs for infrastructure, housing, public facilities and commercial facilities
- Public operating costs for county, municipal and school functions
- Potential revenues to cover public capital and operating costs
- Cost/revenue analysis for public operations
- Impacts on existing industry

The time periods covered by these analyses will be:

- Construction phase
- Steady-state operating phase
- Shut-down phase

In summary, the procedures manual is designed to provide a practical guide to those preparing impact estimates which will permit them to prepare valid and usable cost/revenue analyses with the lowest possible expenditure of money and effort.

5. DATA SOURCES WERE CHECKED IN EACH OF THE FIVE STATE CAPITALS

The completion of the procedures manual requires the collection of a large amount of data on the existing community and statewide population characteristics and governmental practices. To the extent possible, these data should be collected at the state level, in order to:

- Increase the reliability of data
- Reduce the number of data sources required
- Assure comparability among studies

The availability and source of these data were assessed by interviews with key state officials in each of the five state capitals:

- Helena, Montana
- Lincoln, Nebraska
- Bismarck, North Dakota
- Pierre, South Dakota
- Cheyenne, Wyoming

The analyses provided by this procedures manual will not by themselves evaluate the regional impacts or costs and benefits of coal utilization. Many questions of the states regarding the quality of life are not quantifiable. Benefits of coal utilization are not restricted to local communities, but are closely tied to national economic and energy goals.

By standardization of the analyses, and assurance of their completeness and comparability, however, the results of these studies will be useful in regional evaluations.

II. METHODOLOGY

This procedures manual is designed to calculate, over a period of time, the economic costs and benefits of the construction and operation of coal utilization facilities for the community to be impacted.

1. THE TIME PERIOD COVERED IS APPROXIMATELY 30 YEARS

Impacts are to be projected from the start of construction to a potential shutdown time, consisting of:

- Three years of plant construction and mine start-up. This period will have a rapid build-up of temporary construction workers, with a need for housing and services unavailable in the local community. Over the last six months of construction this work force will decline and start-up operations will begin.
- Twenty-five years of plant operation, based on the projected life of the plant. Once in operation, the work force and flow of dollars will be relatively constant.
- Two years of shutdown and termination. At the end of the useful life of the plant, gasification will cease and the plant will be closed, dismantled, or altered for a new use. In this phase, the work force will decline to zero and the community will not need to provide services, though the housing and facilities may remain.

2. THIS MANUAL IS BASED ON A DOLLAR FLOW ECONOMIC MODEL

Generally, the evaluation of basic activity impacts is based upon the concept of an economic system model, which is basically a dollar flow model which describes the flows of dollars into, out of, and internally within the local economy. Selected dollar flows are traced from the economic units generating them, e.g., employed persons, businesses, and households, through the various channels in which they are spent, saved, and invested. The nature and magnitude of the money flow through any one of these channels provide the basis for measuring the demand for that activity in the community.

Within this manual, the elements and concepts of an economic model are used, but this is not a complete or detailed model. More concentration is given in this manual to the numbers of persons employed in base industry, which result in needs for nonbase employees to serve them and, in turn, additional nonbase employees to serve the ones who serve base employees.

Total employment in the community is the major determinant of the community's population, since in a freestanding community most households migrate into and out of the community in response to the number of jobs available in the community. Total employment and total population are, in turn, major determinants of most other socioeconomic characteristics of the community.

The economic model portion of the manual has the following elements:

- Inputs--Available or easily attainable data on existing communities and proposed basic economic activities
- Linkages--The relationships among inputs and impacts
- Impacts--The results of economic activity

Population in the community creates demands for facilities and services. The manual therefore projects, based on new and total population, the capital needs of the community in:

- Infrastructure
- Housing
- Public facilities
- Commercial

Finally, the manual is concerned with the public costs of providing services. An annual cost in the steady state period is calculated for:

- County services
- City services
- Schools

3. COST-BENEFIT ANALYSES HAVE MANY LIMITATIONS

While cost-benefit analysis is a useful tool for evaluating the impacts of coal-gasification plants, there are many limitations of such an analysis, which in this case include the following:

- Social costs and benefits are much more difficult to quantify (if they can be quantified at all) than economic costs and benefits. The likely improvement of the quality of medical care and the disruptions caused by a rapid influx of new residents are much more difficult to quantify than the cost of a new sewer and the increase in sales tax.
- Generalized economic benefits may be difficult to assess. It is anticipated that the coal-gasification plants located in the Old West Region might provide the following benefits:
    - Diversification of the overall economy, with local communities less dependent on one basic employer
    - Improved social opportunities for Indian tribes if plants are near them. This benefit may not be obtainable in any other foreseeable way.

The plain fact is that such benefits and costs in many cases cannot be qualified in any meaningful manner. Such impacts, while not quantifiable, must be considered in the decision-making process.

The costs to a local community may be offset by benefits to the region as a whole or the entire nation. The analysis, by indicating such a condition, may suggest a needed change in who absorbs the cost, e.g., financial support from the Federal

Government or the prospect facility. Accordingly, such impacts should be evaluated in a locally oriented cost-benefit analysis. If such impacts are excluded, conclusions could be reached leading to incorrect decisions.

4. CONSTRUCTION IMPACTS ARE THE MOST DIFFICULT TO PREPARE FOR AND ASSESS

The most difficult period for a local community in the creation of a natural resource/energy facility is the construction phase. The traditional methods of planning and financing private and public services and structures are geared to long periods, e.g., 25 years, rather than the short, intense periods of construction.

Another difficulty is that the construction period is one of daily change. The total construction force will be increasing from the start-up to approximately 30 months later, then decline. Within the construction force, there will be changes of individual workers as the needs of the project change.

To estimate impacts of the construction force, a series of "snapshots" will be taken at significant points during the construction period. The data obtained will be utilized in the cost-benefit analysis to calculate impacts at specific points in time and for the construction period as a whole.

5. FOUR MAJOR TASKS MOVE FROM INPUTS TO COST-REVENUE ANALYSIS

This manual is designed as a practical guide to those preparing estimates permitting them to prepare valid and usable analyses with the maximum economy of effort. To accomplish that objective, the manual is divided into four major work tasks. Each is to be accomplished before moving on to the next task.

(1) Inputs to the Model

- Chapter III--Community Data
- Chapter IV--Coal Utilization

All the necessary inputs to the socioeconomic analysis are identified in this task, correlated precisely to the formulae of the second task.

(2) Linkage Formulae

- Chapter V--Economic Impact
- Chapter VI--Capital Requirements
- Chapter VII--Public Operations
- Chapter VIII--Construction
- Chapter IX--Cost-Revenue Analysis

Calculations are made which translate inputs into outputs.

(3) Outputs

- Economic Characteristics (Chapter V)
- Capital Costs (Chapter VI)
- Public Expenditures (Chapter VII)
- Public Revenues (Chapter VII)
- Construction Impacts (Chapter VIII)
- Community Impacts (Chapter X)

(4) Cost-Revenue Analysis

The outputs of Chapters V-VIII are aggregated and compared to estimate the public costs and revenues over the 30-year life of the coal utilization plant.

To determine the aggregate costs and benefits over the 30-year period, a discounted present value approach is used, based on Office of Management and Budget indicators of the social cost of capital (discount rate).

6. THE CODING SYSTEM LINKS ALL THE INPUTS, FORMULAE, OUTPUTS, AND COST-REVENUE ANALYSIS

The chapters on collection of data on the existing community and cost utilization facility assign a code to each factor. In the subsequent chapters on linkages (Chapters V-IX), each formula which uses an input has the code for that input--and the page on which it is found--precisely noted. The researcher may, therefore, go through the formulae and insert the appropriate input.

The outputs of formulae are in many cases used in subsequent formulae. Each output has its own code which is shown in the formula(e) in which it is used.

The coding system is based on letters and numbers. The first letter indicates source of the factor:

- C = Company
- I = Input - Federal, state or local
- F = Formula
- S = Standard Factor

The second, third, and sometimes fourth letters indicate general area of concern:

- BE = Employment
- HO = Housing
- PO = Population
- MWE = Municipal Water Expenditures
- CPT = County Property Tax

The numbers are assigned to a series of factors within the same source and concern, e.g., for community, city, and other.

Examples of use of the coding system are given in the step-by-step methodology section.

STEP-BY-STEP

1. Define the Community (Chapter III, Section 1)
2. Send Questionnaire to Applicant Company (Chapter IV, Exhibit I)
3. Gather Input Data at State and Local Levels (Chapter III)
4. Complete Company Data--by Questionnaire or Prototype (Chapter IV, Exhibit II)
5. Insert Input Data Into Formulae 1-158
6. Complete Formulae on Economic Impact (Chapter V, Formulae 1-24)
7. Complete Formulae on Capital Requirements (Chapter VI, Formulae 26-54)
8. Complete Formulae on Public Operations (Chapter VII, Formulae 55-106)
9. Complete Formulae on Construction (Chapter VIII, Formulae 107-148)
10. Complete Cost-Revenue Analysis (Chapter IX, Formulae 150-159)
11. Complete Assessment of Impact on Community (Chapter X)

EXAMPLE OF METHOD

To assist the researcher in understanding the use of this manual, the following example is given. The formula is from the economic impact Chapter V and utilizes both input data and the results of an earlier formula.

Formula 3--New Nonbase Employment

The number of new nonbase jobs created is determined by deducting the present nonbase jobs from the total projected for the steady state.

$$\text{F(3)} \quad \frac{\text{New Nonbase Employment}}{(\mathrm{FBE}_3)} = \frac{\text{Total Nonbase Employment}}{(\mathrm{FBE}_2)} - \frac{\text{Current Nonbase Employment}}{(\mathrm{IBE}_2)}$$

$$\frac{\qquad\qquad\qquad}{(\mathrm{FBE}_3)} = \frac{\qquad\qquad\qquad}{(\mathrm{FBE}_2)} - \frac{\qquad\qquad\qquad}{(\mathrm{IBE}_2)}$$

Source of Data

FBE_2 - Formula 2
IBE_2 - Input data, Section 2

Step 1--Insert "Total Nonbase Employment" (Code FBE_2). The source of data shows this is an output obtained from Exhibit III, following page____. In the example, this is 4,162.

Step 2--Insert "Current Nonbase Employment" (Code IBE_2). The source of data shows this is an input collected in Section 2 of Chapter III. In this example, use 1,200.

Step 3--Subtract IBE_2 from FBE_2, i.e., 4,162 - 1,200. The result is 2,962.

Step 4--Place the number 2,962 in space FBE_3.

Note: FBE_3 will subsequently be used in Formula 6.

III. COMMUNITY INPUT DATA

The purpose of this section is to collect information on the community to be impacted by coal utilization. The first portion of the section is devoted to definition of the community. Following that, the researcher will collect the specified information on the community as shown in the second portion of this chapter.

1. THE FIRST IMPORTANT DECISION OF THE SOCIOECONOMIC IMPACT ANALYSIS IS THE DEFINITION OF THE COMMUNITY TO BE STUDIED

This community includes those urban and rural areas which are most likely to be economically impacted by the construction and operation of a coal-utilization facility. As detailed in the economic model, these impacts include demands for goods and services and payments for these demands. The community(s) to be studied, therefore, must comprise those areas in which these goods and services are to be provided, and within which payments will be made.

The area of the Old West Region most likely to be impacted by coal utilization is generally rural, composed of large but lightly populated counties with a few widely dispersed towns. Around the edges of this area are several larger cities which serve as commercial, transportation and cultural/education centers. Within the area are several Indian Reservations. The purpose of this section is to select those rural, town, city or reservation areas to be studied in this analysis.

For purposes of this study we define primary community as that area within which the majority of employees of the coal-utilization facility will reside. It is this community which will have the greatest demands placed upon it for the provision of infrastructure, housing, public facilities, and commercial services. It is within this community that most of the wages earned at the facility will be spent, much of the tax payment will be made, and the greatest changes will take place.

Employees will select their place of residence based on a number of factors to be detailed later in this manual. For this research project, however, selection of the community has to consider two additional factors:

- Availability of base data--Information on the existing community which is readily available and comparable throughout the Region is found at the county level, and generally not below that level. Data on cities and school districts are limited to their expenditure and revenues and do not include population and economic characteristics.

- Legal jurisdiction--With the Old West Region, legal responsibility for the planning and provision of service rests with counties, cities and school districts.

  Every portion of the Region is within a county, which typically provides public safety, road, and health and welfare services. The creation of a city government occurs only in urbanized areas as a voluntary decision of the residents. Cities typically provide a higher level of public safety and road services and water, sewer, and cultural services than provided by counties.

  Each portion of the Region is included within a school district. There may be two districts--one for elementary and one for high school. Within each county there may be one county-wide district or a number of districts covering smaller areas, but school districts are almost always within one county.

In a few cases, either a coal-utilization facility or residential area may be located on an Indian Reservation, which has a different pattern of providing public services than non-reservation communities.

Based on these factors, the most logical definition of "community," for purposes of this study, is the county. Impacts could be measured for the county as a whole, and public costs and revenues determined for the composite local government.

This use of the county is complicated, however, by several significant factors:

- County lines may be so located that residential and other impacts cover more than one county.
- Cities may already be incorporated which would be expected to provide services not provided to the remainder of the county.
- Existing urbanized areas may be so remote that a new town may be required to house facility employees.
- The school district covering the urbanized area will have major impacts not felt elsewhere in the county.
- The coal-utilization facility may be located in a different county, i.e., taxing jurisdiction, than the residential area, which will affect the financing of public services.

Definition of the community to be studied is not simple and must be determined separately for each individual research study. The overall community--covering the area in which facilities are located and employees reside--may include several elements:

- One or more counties

- One or two cities, or none
- Several school districts
- One Indian Reservation, or none

Impacts from coal-utilization will ripple out from the plant site to provide some impact everywhere in the Region, but this analysis will be limited to those areas in which there will be the most significant impact; i.e., substantial new housing, public facilities, or infrastructure will be required. Analysis will generally be oriented to one county; and to the most affected urbanized area within that county. It is assumed that this urbanized area either is or will become an incorporated city. An Indian Reservation will be considered only if the coal-utilization facility is to be located on the Reservation itself (in which case the Reservation is substituted for the city).

NOTE: If the community is so divided among two counties, or more than one city, the manual may be used twice rather than once. The split is made by allocating base employment to each run of the model in Formula 1.

The region of coal-utilization impact is typified by a large number of very small school districts. Only in a few cases is the county composed of only one district. School district boundaries generally bear no relation to the boundaries of a city, but for the most part district boundaries do not run over county lines. The population projection methods of this analysis do not allow the researcher to allocate population to individual school districts. It is possible, however, to project the total new school enrollment for the county as a whole. For this analysis, therefore, school enrollment, capital needs, expenditures and revenues will be projected for the community rather than for an individual district.

This method has one major limitation. If the coal facility is located in a school district other than that in which new school children enroll, there could be major inequities in financing.

2. THE COMMUNITY TO BE STUDIED IS DEFINED BY THE RESEARCHER PRIOR TO INITIATION OF THE STUDY

Selection of the community to be studied is based largely on geographic criteria easily available. The process involves seven steps which are discussed below:

Step 1--Plot on a map the locations of the proposed coal-utilization facilities, e.g., mine and coal-gasification plant

Step 2--Locate on the map:

- Boundary of county within which plant is located
- Nearest city or urbanized area considered capable of serving as a residential area (within 25 miles)
- Nearest larger city of that defined above if it is within commuting distance (not more than 60 miles)
- Indian Reservation boundary (if facility is located thereon)

Step 3--If the nearest city or urbanized area is more than 25 miles away from the facility, consider the possibility of a new town (or company camp) located adjacent to the facility. In this case substitute this new town for the "nearest city" in Step 2. The nearest city should be studied if it is located between 25 and 60 miles from employment.

Step 4--Determine the county and school district jurisdictions of:

- The coal mine
- The processing facility
- The nearest town
- The nearest larger town (if studied)
- The new town (if studied)

Step 5--Select the county(s) to be studied:

- One, if all the elements above are within one county
- Two, if elements are located in two counties

Step 6--Select the city to be studied:

- Nearest urbanized area
- New town (if studied)
- Nearest larger community
- Indian Reservation

Step 7--Submit proposed study jurisdictions to Old West Regional Commission for approval

STANDARD OR STATEWIDE FACTORS

(SF_1) Ratio of Non-Base to Base Employment ____________

Source: Chapter V, Exhibit III

Use: F (2)

(SF_2) Percent Population who will live in city ____________%

Source: Gravity Model, Chapter V, Exhibit IV

Use: F (5)

(SF_3) Average Number of Employees per household ____________

Source: State Department of Economic Development

Use: F (8)

(SF_4) Income Multiplier on New Base Employment ____________

Source: State Department of Economic Development,
State University Bureau of Business Research

Use: F (13)

(SF_5) Percentage Income spent on Retail Sales ____________%

Source: State Department of Revenue

Use: F(15)

(SF_6) Ratio of Wholesale to Retail Sales ____________

Source: State Department of Revenue

Use: F (17)

(SF$_7$) **State Ratio of Taxable Sales** ________________

Source: State Department of Revenue

Use: F (81)

INPUT DATA

Employment

(IBE_1) Total Existing Base Employment ____________

Includes--Farm Proprietor
Farm Wage Earner
Federal Government
Manufacturing
Mining

Source--Regional Economic Information,
Bureau of Economic Analysis,
Department of Commerce

Use--F(1)

(IBE_2) Total Existing Nonbase Employment ____________

Includes--Total Employment ____________
(Minus) Base Employment ____________

Source--REIS

Use--F(3)

Population

(IPO_1) Existing Households in Community ____________

(IPO_{1A}) Existing Households in City ____________

Source--1970 Census of Population,
General Population Characteristics,
State Department of Planning,
Department of Community Affairs

Use--F(9)

(IPO_2) Average Household Size (Statewide) ____________

Source: 1970 Census of Population,
General Population Characteristics

Use--F(10)

INPUT DATA

(IPO$_3$) Existing Population in Community __________

(IPO$_{3A}$) Existing Population in City __________

Souece--1970 Census of Population,
General Population Characteristics

Current Population Reports
(Series P-26) all states except
Wyoming

Use--F(11)

Schools

(ISP$_1$) Percent of School Age Children in Population (State as a whole) __________%

(ISP$_2$) Percent of Elementary School Age Children in School System (State as a Whole) __________%

Source--State Department of Education
Annual Report

Use--F(12), F(12A)

INPUT DATA

Income

(IYN) Average Wage of Nonbase Employees $__________

$$= \frac{\text{Total Earnings of Nonbase Employees}}{\text{Wage and Salary Employment } (IBE_2)}$$

Includes -- Farm

State and Local Government

Contract Construction

Trans, Communication, and Public Utilities

Wholesale and Retail Trade

Finance, Insurance, and Real Estate

Services

Other

Source--REIS

Use--F (13)

(IYO) Total Current Income $__________

Source--REIS

Use--F (14)

Retail Sales

(IRS) Existing Retail Sales $__________

Source--State Department of Revenue,
Department of Planning Census Data

Use--F (16)

INPUT DATA

Housing

(IHO) Normal Percentage of Total Housing Stock Occupied __________ %

Source--State Department of Planning,
Department of Community Affairs
Local Surveys

Use--F(18)

(IHS_1) Percent - Single Family Housing Stock or percentage of new housing stock __________ %

(IHV_1) Vacant Single Family Units __________

Source--Local Surveys

Use--F(19)

(IHS_2) Percent - Multi-Family Housing Stock or percentage of new housing stock __________ %

(IHV_2) Vacant Multi-Family Units __________

Source--Local Surveys

Use--F(20)

(IHS_3) Percent - Mobile Home Units or percentage of new housing stock __________ %

Source--Local Surveys,
County Assessor Count of Mobile Homes

Use--F (21)

(IHV_3) Vacant Mobile Home Park Sites __________

Source--Local Surveys

Use--F(22)

INPUT DATA

IHD_1 Existing Single Family Units ____________

IHD_2 Existing Multi-Family Units ____________

IHD_3 Existing Mobile Home Units ____________
(Includes Occupied and Vacant)

Source--State Department of Planning,
Department of Community Affairs,
Census Data,
Local Surveys

Use--F(23)

INPUT DATA

Capital Requirements

(IRC_1)	State Highway New Construction Cost per Mile	$ ______
(IRC_2)	State Highway Upgrading Construction Cost per Mile	$ ______
(IRU_1)	Miles of New State Highway Needed	______
(IRU_2)	Miles of Existing State Highway Requiring Upgrading	______

Source: State and County Highway Departments, Annual Reports.

Use: F(26)

(IRU_3)	Miles of Road City/Plan	______
(IRC_3)	Construction Cost per Mile	$ ______
(IRC_4)	Cost per Capita of New County Roads	$ ______

Source: County and Local Highway Departments

Use: F (27)

(IRC_5)	Cost per Capita of City Streets	$ ______

Source: City Streets Department

Use: F (28)

(IWC_1) Average Water Distribution Cost per Household $__________

Source: City Engineer, State Department of Health

Use: F (29)

(IDC) Sewage Disposal Construction Cost per Household $__________

Source: City Engineer, State Environmental Protection Agency

Use: F (30)

(IEG_1) Average Hookup Cost per Household (Electricity) $__________

(IEG_2) Average Hookup Cost per Household (Natural Gas) $__________

(IEG_3) Average Hookup Cost per Household (Telephone) $__________

Source: State Public Service Commission or Individual Utilities

Use: F (31)

(IHU_1) Average Size-Single Family Housing (sq. ft.) __________

(IHC_1) Average Cost per Square Foot $__________

Source: Dodge Reports

Use: F (33)

(IHU_2) Average Multi-Family Unit Size (sq. ft.) ____________

(IHC_2) Average Cost per Square Foot $____________

Source: Dodge Reports

Use: F(34)

(IHC_3) Average Mobile Home Cost $____________

Source: Local Surveys

Use: F(35)

(IHC_4) Average Mobile Home Pad Cost $____________

Source: Local Surveys

Use: F(36)

(ISC_1) Construction Cost per Elementary School Classroom $____________

(ISP_3) Current Elementary School Student Population ____________

(ISP_4) Average Elementary Student per Classroom ____________

(ISU_1) Number of Useable Elementary Classrooms ____________

Source: State Department of Education,
Local School Districts

Use: F (37)

(ISC_2) Construction Cost per High School Classroom $____________

(ISP_5) Current High School Student Population ____________

(ISP_6) Average High School Students per Classroom ____________

(ISU_2) Number of Useable High School Classrooms ____________

Source: State Department of Education,
High School Districts

Use: F(38)

(IMC_1) Hospital Construction Cost Per Bed $____________

(IMP) Recommended Hospital Beds per Capita ____________

(IMU) Existing Useable Hospital Beds ____________

Source: State Department of Health

Use: F(39)

(IMC_2) Health Clinic Construction Cost per Capita $____________

Source: State Department of Health

Use: F(40)

(IPC) Cost of Police Facilities to be Constructed per Capita $____________

Source: State Department of Planning,
Department of Community Affairs,
State Police

Use: F(42)

(IJC$_1$) Sheriff Facilities Construction Cost per Capita \$ __________

(IJC$_2$) Court Facilities Construction Cost per Capita \$ __________

(IJC$_3$) Jail Facilities Construction Cost per Capita \$ __________

Source: State Department of Planning,
Department of Community Affairs,
State Police

Use: F (43)

(ILP) Branch Libraries per Thousand Population __________

(ILC) Cost per Branch Library \$ __________

Source: State Department of Planning,
Department of Community Affairs,
Local Officials

Use: F (44)

(IGC$_1$) Cost per Capita of Community Government Offices \$ __________

(IGC$_2$) Cost per Capita of City Government Offices \$ __________

Source: State Department of Planning,
Department of Community Affairs,
Local Officials

Use: F (45)

(IPP) Standard Park Acres per Thousand Population ______________

(IPU_1) Current Park Acreage Available ______________

(IPU_2) Current Park Acreage Developed ______________

(IPC_1) Acquisition Cost per Park Acre $______________

(IPC_2) Development Cost per Park Acre $______________

Source: State Department of Planning,
Department of Community Affairs,
Local Officials

Use: F (46)

(ICU_1) Retail Sales per Square Foot $______________

(ICC_1) Retail space Construction Cost per Square Foot $______________

Source: State Department of Economic Development,
Dodge Reports (cost data)

Use: F (47)

(IWU_1) Wholesale Sales per Square Foot $______________

(IWC_2) Wholesale Construction Cost per Square Foot $______________

(IWS) Existing Whole Space in Square Feet ______________

Source: State Department of Economic Development,
Dodge Reports (cost data)

Use: F (48)

(ICP) Average Office Space per Capita ______________

(ICC_2) Office Space Construction Cost per Square Foot $______________

Source: State Department of Planning,
Department of Community Affairs,
Dodge Reports (cost data)

Use: F (49)

(IHP$_1$) Hotel/Motel Average Rooms per Capita ____________

(IHP$_2$) Hotel/Motel Average Rooms per Base Employment ____________

(IHU$_3$) Hotel/Motel Current Rooms Available ____________

(IHC$_5$) Hotel/Motel Construction Cost per Room $____________

Source: State Department of Economic Development, Dodge Reports (cost data)

Use: F (50)

(IEC) Commercial Recreation Construction Cost per Capita $____________

Source: State Department of Planning

Use: F (51)

(IAV_1) Average State Ratio of Assessed to Market Value Single Family Housing ____________

(IAV_2) Multi-Family ____________

(IAV_3) Mobile Homes ____________

(IAV_4) Utilities ____________

(IAV_5) Commercial ____________

(IAV_6) Coal Company Facilities ____________

Source: State Department of Revenue,
State Taxpayers Association

Use: F (52)

(ICV_1) Existing Assessed Valuation in Community $____________

(ICV_2) Existing Assessed Valuation in City $____________

Source: State Department of Revenue,
County and City Assessors,
State Taxpayers Association

Use: F (54)

INPUT DATA

Municipal Government Expenditures

(IPE_1) Police Protection Costs Per Capita $____________
(City Population Group = FTP_1)

Source--1967 Census of Governments, Finances of Municipalities

Use--F (55)

(IFE) Fire Protection Costs Per capita
(City Population Group - FTP_1) $____________

Source--1967 Census of Governments, Finances of Municipalities

Use--F (56)

(IWE_1) Standard Operating Rate for Type of Water Supply Facility
(Cost per thousand gallons) $____________

(IWP) Average Water Use Per Capita ____________

Source--State of County Engineer, Water Commission

Use--F (57)

(IWE_2) Average Water Cost per Household $____________
(City Population Group - FTP_1)

Source--1967 Census of Governments, Finances of Municipalities

Use--F (57A)

(IDE_1) Standard Operating Rate for Type of Sewage Facilities
(Cost per thousand gallons) $____________

(IDP) Average Sewage Per Capita (000 gallons) ____________

Source--State or County Engineer,
State Health Department,
Environmental Protection Agency

Use--F (58)

(IDE_2) Average Sewage Cost Per Household $____________
(City Population Group = FTP_1)

Source--1967 Census of Governments,
Finances of Municipalities

Use--F (58A)

(IGE) Sanitation Cost Per Capita $____________
(City Population Group = FTP_1)

Source--1967 Census of Governments,
Finances of Municipalities

Use--F (59)

(ISS_1) Miles of Arterial Street ____________

(ISE_1) Maintenance Cost Per Mile (Arterials) $____________

(ISE_2) Maintenance Cost Per Mile (Local Streets) $____________

Source--State Highway Department,
City Street Department

Use--F (60)

(ISE_3) State Maintenance Cost Per Capita
(City Population Group = FTP_1) $____________

Source--1967 Census of Governments,
Finances of Municipalities

Use--F (60C)

(IRE_1) **Park Maintenance Cost Per Acre** $__________

Source--State Parks Department,
City Public Works or Parks Department

Use--F(61)

(IRE_2) **Recreation Costs Per Capita**
(City Population Group = FTP_1) $__________

Source--1967 Census of Governments,
Finances of Municipalities

Use--F(62)

(ILE) **Library Costs Per Capita**
(City Population Group = FTP_1) $__________

Source--1967 Census of Governments,
Finances of Municipalities

Use--F(63)

(IME_1) General Municipal Government Cost Per Capita
(City Population Group = FTP_1) $__________

Includes: Total Municipal Expenditure Per Capita
(All Functions)

Minus
- Police Protection Per Capita
- Fire Protection Per Capita
- Water and Sewer Per Capita
- Sanitation Per Capita
- Street Maintenance Per Capita
- Park Maintenance Per Capita
- Recreation Per Capita
- Library Per Capita

= Net General Government Per Capita

Source--1967 Census of Governments,
Finances of Municipalities

Use--F(64)

(IME$_2$) Total Municipal Expenditure Per Capita
All Functions
(City Population Group = FTP$_1$) $\_\_\_\_\_\_\_\_\_\_$

Source--1967 Census of Governments,
Finances of Municipalities

Use--F(65A)

INPUT DATA

County Government Expenditures

(ISE$_4$) Highway Expenditure Per Capita
(County Population Group = FTP) $ __________

Source--1967 Census of Governments,
Finances of County Governments

Use--F(66)

(IWE$_3$) Welfare Expenditure Per Capita
(County Population Group = FTP) $ __________

Source--1967 Census of Governments,
Finances of County Governments

Use--F(67)

(IHE) Health and Hospital Expenditure Per Capita
(County Population Group = FTP) $ __________

Source--1967 Census of Governments,
Finances of County Governments

Use--F(68)

(IPE$_2$) Police Expenditure Per Capita
(County Population Group = FTP) $ __________

Source--1967 Census of Governments,
Finances of County Governments

Use--F (69)

(IJE) Criminal Justice Expenditure Per Capita
(County Population Group - FTP) $__________

Source--1967 Census of Governments,
Finances of County Governments

Use--F (69A)

(ICE_1) General County Expenditure Per Capita
(County Population Group = FTP) $__________

Includes: Total County Expenditures Per
Capita (all functions)

Minus - County Highway Expenditure
- County Welfare Expenditure
- County Hospital and Health Expenditure
- County Police and Criminal Justice Expenditure

Source--1967 Census of Governments,
Finances of County Governments

Use--F (70)

(ICE_2) Total County Expenditures Per Capita $__________

Source--1967 Census of Governments,
Finances of County Governments

Use--F (71A)

INPUT DATA

School Expenditures

(ISE$_5$) Cost Per Elementary Student $ ____________

Source--State Department of Education
or Annual Report

Use--F (72)

(ISE$_6$) Cost Per High School Student $ ____________

Source--State Department of Education
or Annual Report

Use--F (73)

(ISR$_{1A}$) State Elementary School Allocation Rate $ ____________

(ISR$_{1B}$) State High School Allocation Rate $ ____________

Source--State Department of Education,
Department of Revenue

Use--F (74A), F (74B)

(ISR$_{2A}$) Base Level of Assessed Valuation (Elementary) $ ____________

(ISR$_{2B}$) Base Level of Assessed Valuation (High School) $ ____________

(ISR$_{3A}$) State Support Factor (Elementary) ____________

(ISR$_{3B}$) State Support Factor (High School) ____________

Source--State Department of Education
or Department of Revenue

Use--F (75)

(ISR$_{4A}$) Average Other State Aid Per Pupil (Elementary) $ ____________

(ISR$_{4B}$) Average Other State Aid Per Pupil (High School) $ ____________

Source--State Department of Education
or Department of Revenue

Use--F (76)

(ISR$_{5A}$) Federal Allocation Rate Per Pupil (Elementary) $ ____________

(ISR$_{5B}$) Federal Allocation Rate Per Pupil (High School) $ ____________

Source--State Department of Education
or Department of Revenue

Use--F (77)

(IPR_{1A}) Elementary Operating Tax Rate ____________

(IPR_{1B}) High School Operating Tax Rate ____________

Source--State Department of Education
or Department of Revenue

Use--F (78)

INPUT DATA

City Revenues

(IPR$_1$) Municipal Property Tax Rate \$ ______________

Source--State Department of Revenue,
Department of Education,
State Taxpayers Association

Use--F (80)

(ISR$_1$) Municipal Sales Tax Rate \$ ______________

(IMSR) Existing Sales Tax Collections \$ ______________

Source--State Department of Revenue,
State Taxpayers Association

Use--F (81B)

(IUS$_1$) Current Utility Sales within City Limits

Electricity \$ ______________
Natural Gas \$ ______________
Telephone \$ ______________

(IUS$_2$) New Utility Sales within City Limits

Electricity \$ ______________
Natural Gas \$ ______________
Telephone \$ ______________

(IFR) Franchise Tax Rate

Source--State Public Service Commission,
Department of Revenue,
Individual Utilities

Use--F (82)

(ICR) Cigarette Tax Allocation Per Capita $__________

Source--State Department of Revenue

Use--F(83)

(ILR) Alcoholic Beverage Tax Allocation Per Capita $__________

Source--State Department of Revenue

Use--F(84)

(IAR) Auto In-Lieu Tax Allocation Per Capita $__________

Source--State Department of Revenue

Use--F(85)

(IGR) Motor Fuel Sales Tax Allocation Per Capita $__________

Source--State Department of Revenue

Use--F(86)

(IIR) Insurance Premium Tax Allocation Per Capita $__________

Source--State Department of Revenue

Use--F(87)

(IWR) Current Average Water and Sewer Cost Per Household $__________

Source--State Water Commission,
Department of Health,
City Water Engineer

Use--F (89)

(IBR) Business License Fee Ratio to Sales $__________

Source--State Department of Revenue

Use--F(91)

(IOR_1) **Current Ratio of Other Revenues to Revenues** $ ______

Source--State Department of Revenue

Use--F(92)

(IRR_1) **Statewide Average Municipal Revenue Per Capita** $ ______

Source--State Department of Revenue

Use--F(93B)

INPUT DATA

County Revenues

(IPR_2) County Property Tax Rate $ ____________

Source--State Department of Revenue
Department of Education

State Taxpayers Association

Use--F (94)

(ISR_2) County Sales Tax Rate $ ____________

(ICSR) Existing County Sales Tax Collections $ ____________

Source--State Department of Revenue

State Taxpayers Association

Use--F (95)

(IUS_3) Current Utility Sales in the Remainder of the County

Electricity $ ____________
Natural Gas $ ____________
Telephone $ ____________

(IUS_4) New Utility Sales in the Remainder of the County

Electricity $ ____________
Natural Gas $ ____________
Telephone $ ____________

Source--State Public Service Commission,
Department of Revenue,
Individual Utilities

Use--F (96)

(IRR_2) State Share of County Welfare **Expenditures** ________%

Source--State Department of Welfare,
Department of Revenue

Use--F (102)

(IRR_3) State Property Tax Exemption Reimbursement Allocation for Loss of Revenue ________%

Source--State Department of Revenue

Use--F (103)

(IOR_2) Current Ratio of Other Revenues to Revenues ________

Source--State Department of Revenue

Use--F (105)

(IRR_4) Statewide Average County Revenue Per Capita $________

Source--State Department of Revenue

Use--F (106B)

IV. COAL UTILIZATION

This chapter discusses the types of coal utilization activities anticipated in the region. It includes a sample questionnaire for collecting pertinent company data. Finally, it presents data for a prototype coal gasification facility and supplying coal mine.

1. THE MODEL CAN BE USED FOR ANY COAL UTILIZATION FACILITY OR COMBINATION OF FACILITIES

Four principal facilities are likely to appear in the region:

- Coal gasification plant
- Coal liquefaction plant
- Electric power plant
- Mine operations
  - Feed stock
  - Export by unit train

Because the manual is based on a dollar-flow model, the key inputs of employment, wages, local purchases, and alternative land use can be derived for any of these facilities. Use of this data in the model will be the same.

2. COMPANY INPUT DATA MUST BE ASSEMBLED BY THE RESEARCHER

Included as Exhibit IA through IE, following this page, are forms that may be used by the researcher to collect data from

EXHIBIT IA

Old West Regional Commission

FACILITY

Company ____________________

Contact ____________________

1) Type of Facility ____________________

2) Proposed Location of:

Mining Operation ____________________

Coal Gasification Plant ____________________

Electric Power Plant ____________________

REQUIRE MAP OF EACH OF THESE

3) Capacities

	Annual	Daily
Mine Output (tons)		
High Btu Gas (mmcf/d)		
Low Btu Gas (mmcf/d)		
Electric Power (MW)		

4) Area (in acres)

Plant Site Complex Size ____________________

Former or Current Use ____________________

Coal Mining Lands Annual Use ____________________

Total Projected Land Use ____________________

Former or Current Use ____________________

5) Estimated Construction Cost $ ____________________

EXHIBIT IB

Old West Regional Commission

EMPLOYMENT

54 b

	Months from Start(5)							Steady State	Percent Male(6)	Average Wage (7)	Share to be Hired Locally (8)
Employment (1)	0	6	12	18	24	30	36				
Construction (2)								0			
Plant Operation (3)											
Mine Operation (4)											
Total								(C1)		(C2)	

NOTES TO EXHIBIT IB

1) If located on Indian Reservation, indicate percentage of employees who will be Indian--this will require filling out two forms one for Indians and one for non-Indians plus one form for total.

2) These numbers are to be those of full-time employees working on the construction of the plant facility and/or mines to be located at the site under study. Pipeline or transmission line construction workers are included if based at same construction site.

3) Plant Operations includes all personnel in coal gasification, liquification or electric power generation plants.

4) Mine Operation includes all personnel working in mine and transporting coal to plant site. (Mine operations may be by independent contractor).

5) Table calls for member of personnel at specific points of time as usually described by engineers for manning loads:

Start - first month of operation

6 - 36 -- end of designated month

Steady state - period of time approximately 4-6 years after start of construction (and 1-3 years after opening of plant when temporary construction workers have left)

6) Indicates projected percentage of employees who are male. Unless otherwise indicated it will be assumed that clerical are female and all others are male.

7) Need average annual wages in 1974 dollars for positions included within that category. This may be calculated by dividing the total annual wages by the number of positions. The wage amount wanted is that which will appear as gross income on W-2 forms. Do not include fringe benefits paid for by company. Do not include overtime unless it is a permanent condition.

8) This is to be projected for the percent of personnel within each category who are to be hired from within the community. Experience indicates these are likely to be largely clerical, operators and laborers.

EXHIBIT IC

Old West Regional Commission

UTILITIES

1) Water Requirements

Water Used ____________ mgd

____________ acre feet/year

Source of Water Supply
(river, reservoir, etc.)

Community Supply ____________ or Separate ____________

Distance from plant ________________ (Length of pipeline)

Pipeline capacity ____________________

2) Sewage Disposal

Capacity Requirements ____________ mgd

Type of Unit __________________

Location ________________________

Distance from Plant ______________

3) Electric Power Requirements ________________

Generated in Plant? ____________________

4) Access Roads

Location From ____________ to ____________________
(Plant, mine) (Community)

Distance _______________

5) Railroad

From Plant to railroad ______________________

EXHIBIT ID

Old West Regional Commission

COMMUNITY PAYMENTS

1) Coal Payments

Land Lease - Annual Payments ____________________

To ______________________________________

Coal - Royalties ____________________________ /ton

To ______________________________________

2) Local Purchases (Annual dollar value) (C_3)

Wholesale goods ______________________________

Gas and Oil ______________________________

Service ______________________________

Transporation ______________________________

Other ______________________________

Total ______________________________

3) Tax Payments

Projected Assessed Valuation

Plant ______________________________)

) (C_4)

Mine ______________________________)

Pipe/Transmission Lines ____________________

Projected Annual Tax Payments

State Income ______________________________

State Property ______________________________

State Severance ______________________________

State Sales Tax ______________________________

County Sales Tax ______________________________ (C_5)

County Property ______________________________

School District Property ______________________________

EXHIBIT IE

Old West Regional Commission

BY-PRODUCTS

1) Types of By-products ____________________

2) For Each Type

Daily Amounts ____________________

Annual Amounts ____________________

Projected Use

- Shipped outside Region for processing ____________________
- Shipped to within Region for processing ____________________
  (Location, method of shipment)
- Processed at plant site
  . Number of employees ____________________
  . Annual Wages ____________________

Unprocessed Wastes ____________________

By-products of unprocessed wastes ____________________ companies. These forms may be attached to a letter requesting data from a company. The recommended approach is interviewing by the researcher. This will ensure complete and appropriate data in the following areas:

- Facility
- Employment
- Utilities
- Community payments
- By-products

Certain of the information will be collected for general informational purposes and other as company input data. The specific data inputs are noted by input coding, such as C_1. Particular attention should be given to ascertaining these figures as precisely as possible. If data is not obtainable, figures from the prototypes can be incorporated.

3. DATA FOR PROTOTYPE FACILITIES PRESENTED AS ALTERNATIVE INPUTS

Sometimes company data will not be available to the researcher. A company's plans may be too indefinite to supply the required data. Also a company may try to reduce visibility by keeping figures confidential. At these times, data can be used from prototypes. These prototype data are derived from the companies involved with the Navajo Generating Station at Page, Arizona and their construction contractors.

Data have been presented for a 250 million CFD coal gasification plant and its supplying mine. If a liquefaction plant or a power generating station was constructed, additional data are necessary. Also, if the mine exports coal as well as supplies the gasification plant, mine figures would require adjustment.

EXHIBIT IIA

Old West Regional Commission

PROTOTYPE COAL GASIFICATION FACILITIES

Type: Coal Gasification Plant

Capacity	Annual	Daily
Input--Feed Stock--Coal	9-10 mm tons	23.5-30.5 m tons
Output--BTU	82 trillion	250 million
Cu Ft/Gas	82 billion	250 million

Area of Land Required: 950-1,000 acres

Estimated Construction Cost: $350-$500 million

Employment	Number			Average Wage
Construction Phase	Low	Mid	High	
Month 6	600	1,300	2,000	$10,000-$15,000
Month 12	1,900	2,400	2,900	$15,000-$25,000
Month 18	3,100	3,250	3,400	$15,000-$25,000
Month 24	2,200	2,400	2,600	$15,000-$25,000
Month 30	0	250	500	$15,000-$25,000
Month 36	0	0	0	
Plant Operation Phase	Low		High	
Month 6	0		0	$10,000-$12,000
Month 12	26		30	$10,000-$12,000
Month 18	42		55	$10,000-$12,000
Month 24	72		80	$10,000-$12,000
Month 30	268		300	$10,000-$12,000
Month 36	550		615	$10,000-$12,000
Steady State	550		615	$10,000-$12,000

Utility Requirements	Low	Probable	High
Water--GPM	7,123	22,315	30,387
Acre Feet/Year	10,300	32,400	44,100

Sewage--Will be provided at the plant, not part of community system.

Electric Power--Self-generated.

EXHIBIT IIA

Community Payment	Annual
Local Purchases--Construction Phase	$14,000,000
Operating Phase	$ 8,000,000

By-Products	Amount	Annual Value
Elemental Sulfur	7 long tons/hr	$ 552,000
Tar (16,000 BTU/lb)	44 tons/hr	$3,330,000
Tar Oil (17,200 BTU/lb)	24 tons/hr	$1,953,000
Naptha	10 tons/hr	$3,690,000
Crude Phenols	5 tons/hr	$3,154,000
20% Aqueous Ammonia	50 tons/hr	$1,971,000

EXHIBIT IIB

Old West Regional Commission

PROTOTYPE COAL GASIFICATION FACILITIES

Type: Mine

Capacity	Annual	Daily
Output	9-10 mm tons	23.5-30.5 m tons

Area of Land Required: Total over plant life 11,000 acres

Construction Cost: N/A

Employment	Number	Average Wage
Constrution Phase		
Month 6	0	$15,000-$25,000
Month 12	80	$15,000-$25,000
Month 18	185	$15,000-$25,000
Month 24	185	$15,000-$25,000
Month 30	80	$15,000-$25,000
Month 36	0	$15,000-$25,000
Operation Phase		
Month 6	0	
Month 12	0	
Month 18	0	
Month 24	185-205	$13,500
Month 30	185-205	$13,500
Month 36	185-205	$13,500
Steady State	185-205	$13,500

Utility Requirements:

Water--1,300 GPM (Gallons per Minute)
1,900 Acre Feet/Year

Sewage--Capacity provided at plant site.

Electric Power--Self-generated.

Solid Waste--Capacity provided at plant site.

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V. ECONOMIC IMPACT

The purpose of this section is to project the economic characteristics of the community which will be impacted by coal utilization, including:

- Employment
- Population
- Income
- Retail Sales
- Housing Needs

The basic inputs for this chapter have been collected in Sections 1 and 2 of Chapter III. The results of this chapter will be used in Chapter VI to project capital needs and in Chapter VII to project public operations.

1. THE PRINCIPLE DETERMINATE OF POPULATION IS THE NUMBER OF BASE EMPLOYEES

The number of base employees is estimated as those employees of the coal utilization facilities proposed for the community. No consideration is given in this analysis to the potential for additional base employment from other types of industry.

Base employment is not necessarily limited to the employees of one facility. In some communities, a company will propose more than one facility. This procedures manual is able to accommodate more than one facility by combining the base employment for inclusion in Formula 1.

If facilities are not to be built simultaneously more than one run of the manual may be required. The results of the first run describing the projected community would be used as the "existing" community in subsequent runs.

2. NONBASE EMPLOYMENT IS RELATED TO COMMUNITY SIZE AND LOCATION

The number of nonbase employees attracted to an area by an increase in base employment is a major determinant of the total population increase. This relationship is usually described as the ratio of nonbase to base employment.

For use in this analysis, nonbase employment will determined for the entire community. The ratio of nonbase to base employment varies substantially from area to area--primarily as a function of total population size and, to a lesser extent, the degree to which the area ("community," urbanized area, etc.) acts as a service center for persons in the surrounding areas.

Small towns in isolated areas usually supply only minimum service to their residents and, as a result, have a very low ratio of base to nonbase employment. Ratios may range from 1:0.2 to 1:0.5. Older major metropolitan areas offer a broad range of specialized goods and services to entire regions and may have base/nonbase ratios of over 1:3.

Several alternate methods are available to project nonbase employment:

- Federal Census, state, or county sources can be used to determine employment by industry for the community being analyzed. These industry categories can be classified as base or nonbase, and the ratio of nonbase to base employment derived. If the anticipated increase will be substantial, i.e., increase the existing population by 50% or more, the existing ratio of nonbase to base employment will increase. For projection purposes, a new ratio should be developed from data on comparable towns (preferably nearby) which have a base employment level similar to that anticipated for the town or area being analyzed. Ideally, several comparable situations should be analyzed before selecting a new employment ratio.

- Standard factors may be used based on the experience of western counties with natural resource or energy production industries. The factors are shown here based on total base employment, as total population will not be known until after nonbase employment is calculated. As shown on Exhibit III, the median is that factor which may normally be used. If the community is rather isolated from major commercial centers, or serves other parts of the region for commercial and service purposes, the higher end of range would be more appropriate. The lower end of the range would apply in communities close to a larger center, or on an Indian Reservation.

EXHIBIT III

Old West Regional Commission

NONBASE/BASE EMPLOYMENT RATIO

Total Base Employment	Low Range	Median Range	High Range
200-400	0.25	0.45	0.65
400-600	0.40	0.65	0.90
600-800	0.50	0.85	1.20
800-1000	0.60	1.05	1.50
1000-1200	0.70	1.20	1.70
1200-1400	0.80	1.35	1.90
1400-1600	0.90	1.50	2.10
1600-1800	1.00	1.60	2.20
1800-2000	1.10	1.70	2.30
2000-2500	1.20	1.85	2.50
2500-3000	1.30	2.00	2.70

Example:

If total base employment (FBE_1) equals 2,250 [say 1250 coal utilization (C_1) and 1000 existing base (IBE_1)], and if community falls in median range of Exhibit III, then:

$$\frac{\text{Total Nonbase Employment}}{(FBE_2)} = \frac{\text{Total Base Employment}}{(FBE_1)} \times \frac{\text{Ratio of Nonbase to Base Employment}}{(SF_1)}$$

$$\frac{4162}{(FBE_2)} = \frac{2250}{(FBE_1)} \times \frac{1.85}{(SF_1)}$$

Thus: Nonbase Employment = 4162

Source: Booz, Allen & Hamilton, Inc.

New jobs created in the community in either the base or nonbase sector may be persons presently residing in the community who are currently unemployed. To some extent this may then reduce the need for new employees and their families to move to the community. This analysis, however, will not take current unemployment into account for the following reasons:

- Insufficient data is available region-wide to determine the extent of unemployment, the availability of needed skills and those not in the labor force who could take jobs.
- A minimum level of unemployment is typical, and only the number above that level could be considered to reduce the new population required.
- There is no way of knowing how many of the jobs will be taken up permanently by temporary construction workers who decide to stay.
- The new facility(s) will attract persons without a job to the community likely offsetting any hiring locally of unemployed persons.

The result of this assumption is that the total number of unemployed will remain constant, but the unemployment rate will decline with increased total labor force.

3. RESIDENCE WITHIN THE CITY IS DEPENDENT ON DISTANCE, SIZE, AND AMENITIES

The number of new base employees who will live in the "community" (or other geographical area selected for analysis) is the principal determinant of the new population which will be introduced. In this analysis, all base employees are assumed to live in the community. Within that community, in order to make later projections, residence will be determined for:

- City (existing town or new town)
- Remainder of community

An additional city may be added if only a small proportion is projected to choose the closer city. The remainder of the community will be the rest of the county, unless a second county is a major place of residence. In either case, additional runs of this analysis may be made.

The method for estimating the percent of all new base employees who will live in a given area is highly judgmental, and an extension of the reasoning used to define the "community" initially. The principal factors to be considered include:

- Accessibility from place of work to residence (in time, distance, and travel expense)
- Housing availability (supply, cost, type, and quality)
- Existing infrastructure (public facilities including schools)
- Availability of shopping and recreational facilities and other amenities
- Attitude and ability of local community to accept new population

An evaluation of these factors to estimate the geographical distribution of new employment will be highly judgmental. Ideally, these estimates should be made by a planner/economist familiar with both the community to be affected and the impacts of large new installations on similar areas. The process is an iterative one of matching trade-offs between anticipated demands (both numbers of persons and probable preferences) with area supply capabilities.

The percent who will live in the city can be quantified to some extent through use of a simplified "gravity model" such as Exhibit IV on the following page. Alternatively, the researcher can use the allocation procedure set forth in Exhibit IV-A. Both, however, are only suggested procedures for the researcher.

If the researcher wishes to make his own population allocation the following assumptions should be used:

- Workers will normally choose to live in the closer town if housing and amenities are available.
- If the closer town is more than 20 to 25 miles from employment, or is not likely to be able to serve employees, than the potential for a new town within five miles of the plan should be used in the gravity model.
- A second town will not be considered an alternate choice if it is over 50 miles from employment.
- Employees not living in the city will live elsewhere within the "community."

EXHIBIT IV (1)

Old West Regional Commission

GRAVITY MODEL FOR ESTIMATING WORKER CHOICE OF RESIDENCE BETWEEN TWO TOWNS

$$SF_2 = f \frac{\frac{1000}{d_a^2}}{\frac{1000}{(d_a)^2} + \frac{1000}{(d_b)^2}} + (1-f)\frac{a}{a+b}$$

Where:

SF_2 = % of workers choosing to live in Town A

f = importance of work trips to family (range from 40% to 50%)

$1-f$ = importance of nonwork trips to family (range from 60% to 50%)

d_a = time-distance in minutes, employment center to Town A (plus 5 minutes terminal time)

d_b = time-distance in minutes, employment center to Town B (plus 5 minutes terminal time)

a = population size of Town A

b = population size of Town B

Example:

Plant to Town

	miles	time	time + 5	$(t+5)^2$	population 1970
Town A	7	8	13	169	1562
Town B	12	14	19	361	7751

(we assume that $f = .45$)

EXHIBIT IV (2)

$$SF_2 = .45 \frac{\frac{1000}{169}}{\frac{1000}{169} + \frac{1000}{361}} + .55 \frac{1562}{1562 + 7751}$$

$$SF_2 = .45 \times \frac{5.917}{5.917 + 2.770} + .55 \frac{1562}{9313}$$

$$SF_2 = (.45 \times .68113) + (.55 \times .16772)$$

$$SF_2 = .3065 + .0922$$

$$SF_2 = .3987$$

$$SF_2 = .4$$

EXHIBIT IV-A

Old West Regional Commission

METHODOLOGY FOR ALLOCATION OF POPULATION TO TOWNS AND REMAINDER OF THE COMMUNITY

The points for each of the four categories are to be allocated among:

- Town A--the closer town to the new plant; this may be a new town if the closer town is more than 20 to 25 miles away.
- Town B--a second town which might be attractive to facility employees, not to be considered if smaller than Town A (this choice is optional).
- Remainder of Community--that part of the community outside Town A and Town B.

Points	Factors To Be Weighed	Guidelines	Town A	Town B	Remainder of Community
50	Distance from the facility				
	. Closest possible	45-50			
	. 2 to 5 miles	40-45			
	. 6 to 10 miles	35-40			
	. 11 to 15 miles	30-35			
	. 16 to 20 miles	25-30			
	. 21 to 25 miles	20-25			
	. More than 25 miles	0-20			
25	Size of the town				
	. Largest in the community, e.g., over 60%	20-25			
	. From 40% to 60%	15-20			
	. One of equal towns	10-15			
	. Town B larger (Applies to A)	5-10			
15	Amenities				
	. Good, e.g., city government, shopping center, high school, county seat	8-15			
	. Adequate, e.g., unincorporated, no shopping center	5-10			
	. Poor, e.g., little shopping, no High School	0- 5			
10	Availability of housing				
	. Excess supply (more than 200 units or 10% vacancy)	7-10			
	. Adequate supply (100 to 200 units or 5%-10% vacancy)	2- 8			
	. Under supply (less than 100 units or under 5% vacancy)	0- 5			
100	Total				

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4. HOUSING DEMAND IS RELATED TO NEW HOUSEHOLDS MOVING TO THE COMMUNITY

From the projections of new households in the community, it is rather simple to determine housing demand. Two major questions have to be answered:

- How much vacant housing is available to reduce new housing demands?
- What share of new housing will be allocated to single family, multi-family and mobile homes?

The vacancy question will be answered by projecting the total new housing demand and adding an appropriate vacancy factor for the community as a whole. From that, the number of vacant available units will be subtracted to determine the need for constructing new housing units. This will be done separately for single family and multi-family units. It is assumed there are no vacant mobile homes.

The share of housing allocated to each type could be determined by applying current ratios for the area, or by looking at the experience of other similar areas. It is likely that existing communities will be largely single family, and this pattern will likely continue. There will, however, be more of a demand from new residents for multi-family units, especially from families without children. Mobile homes will be demanded, not necessarily because they are preferred but because they can be afforded by young and lower income employees.

Patterns could change over the life of the community. A large number of mobile homes provided for construction workers will be available at the beginning. As the community grows and incomes rise, a higher proportion of single family houses may be desired.

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FORMULAT #1
TOTAL BASE EMPLOYMENT

Employment can be classified as based or nonbase by the industry in which it occurs. Generally, an industry is considered "base," or an export industry for an area if it:

- Receives more than 50% of its capital from outside the area
- Exports more than 50% of its product outside the area

The new coal utilization plants and mines are base industry because more than 50% of their capital and final product comes from and returns to outside the area. Existing base employment is primarily in agriculture, manufacturing, and mining.

$$F(1)\quad \frac{\text{Total Base Employment}}{(FBE_1)} = \frac{\text{Existing Base Employment}}{(IBE_1)} + \frac{\text{New Base Employment}}{(C_1)}$$

$$\frac{\rule{4cm}{0.4pt}}{(FBE_1)} = \frac{\rule{4cm}{0.4pt}}{(IBE_1)} + \frac{\rule{4cm}{0.4pt}}{(C_1)}$$

Source of Data

IBE_1 - Input data, Section 2
C_1 - Company input data, Chapter IV

FORMULA #2
TOTAL NONBASE EMPLOYMENT

The number of nonbase employees attracted to an area by an increase in base employment is a major determinant of the total population increase. This relationship is usually described as the ratio of nonbase to base employment.

Total nonbase employment is calculated on the basis of a ratio to total base employment, rather than new base employment.

$$F(2)\ \frac{\text{Total Nonbase Employment}}{(FBE_2)} = \frac{\text{Total Base Employment}}{(FBE_1)} \times \frac{\text{Ratio of Nonbase to Base Employment}}{(SF_1)}$$

$$\frac{\hspace{4cm}}{(FBE_2)} = \frac{\hspace{4cm}}{(FBE_1)} \times \frac{\hspace{6cm}}{(SF_1)}$$

Source of Data

FBE1 - Formula 1
SF_1 - Standard factor, Section 1

FORMULA #3
NEW NONBASE EMPLOYMENT

The number of new nonbase jobs created is determined by deducting the present nonbase jobs from the total projected for the steady state.

$$F(3)\quad \frac{\text{New Nonbase Employment}}{(FBE_3)} = \frac{\text{Total Nonbase Employment}}{(FBE_2)} - \frac{\text{Existing Nonbase Employment}}{(IBE_2)}$$

$$\frac{\hspace{5cm}}{(FBE_3)} = \frac{\hspace{5cm}}{(FBE_2)} - \frac{\hspace{5cm}}{(IBE_2)}$$

Source of Data

FBE_2 - Formula 2

IBE_2 - Input data, Section 2

FORMULA # 4
TOTAL EMPLOYMENT

Total employment in the community combines base employment and nonbase employment.

F(4) Total Employment in Community (FBE_4) = Total Base Employment (FBE_1) + Total Nonbase Employment (FBE_2)

__________ (FBE_4) = __________ (FBE_1) + __________ (FBE_2)

Source of Data

FBE_1 - Formula 1
FBE_2 - Formula 2

At this point, it is appropriate to summarize the projections of base/nonbase and existing/new/total employment:

SUMMARY OF TOTAL EMPLOYEMENT

	Existing		New		Total
Base	__________ (IBE_1)	+	__________ (C_1)	=	__________ (FBE_1)
Nonbase	__________ (IBE_2)	+	__________ (FBE_3)	=	__________ (FBE_2)
Total	__________ (FBE_{4A})	+	__________ (FBE_{4B})	=	__________ (FBE_4)

FORMULA # 5
NEW BASE EMPLOYEES LIVING IN THE CITY

The number of new base employees projected to live in the city is affected by the distance, size and amenities of the city, as described in Section 3 of this chapter. This ratio will be estimated by the researchers, assisted by the gravity model techniques.

$$F\ (5A)\quad \frac{\text{New Base Employment in City}}{(FBE_{5A})} = \frac{\text{New Base Employment}}{(C_1)} \times \frac{\text{Percent Who Will Live in City}}{(SF_2)}$$

$$\frac{\qquad\qquad\qquad\qquad}{(FBE_{5A})} = \frac{\qquad\qquad\qquad\qquad}{(C_1)} \times \frac{\qquad\qquad\qquad\qquad}{(SF_2)}$$

$$F\ (5B)\quad \frac{\begin{array}{c}\text{New Base Employment}\\ \text{in Remainder of Community}\end{array}}{(FBE_{5B})} = \frac{\text{New Base Employment}}{(C_1)} - \frac{\text{New Base Employment in City}}{(FBE_{5A})}$$

$$\frac{\qquad\qquad\qquad\qquad}{(FBE_{5B})} = \frac{\qquad\qquad\qquad\qquad}{(C_1)} - \frac{\qquad\qquad\qquad\qquad}{(FBE_{5A})}$$

Source of Data

C_1 = Company input data, Chapter IV
SF_2 = Standard factor, Section 1

FORMULA # 6

NEW NONBASE EMPLOYMENT LIVING IN THE CITY

Since community is defined as that area in which employees live, it is assumed that all nonbase employees will, live in the community. The proportion which will live in the city is assumed to be higher than for base, as the city will be the primary location of nonbase employment. For purposes of this analysis, it is assumed that nonbase employees will be only 50 percent as likely to locate outside the city as base employees:

$$F(6A)\ \frac{\text{New Nonbase Employees Living in the City}}{(FBE_{6A})} = \frac{\text{New Nonbase Employees}}{(FBE_3)}$$

$$\times\ \left[1 - \left(1 - \frac{\text{Percent of Base Employees in City}}{(SF_2)}\right) \div 2\right]$$

$$\frac{\qquad\qquad}{(FBE_{6A})} = \frac{\qquad\qquad}{(FBE_3)} \times \left[1 - \frac{\left(1 - \frac{\qquad\qquad}{(SF_2)}\right)}{2}\right]$$

Example: Assume percent of base employees in city is 40% and total new nonbase employees = 4162 (See Exhibit IV, example), then:

$$1 - \frac{1 - .40}{2} = 1 - \frac{.60}{2} = 1 - .30 = .70$$

and 2913 = 4162 x .70

Thus: New nonbase employees living in City (FBE_{6A}) = 2913

Formula 6 (Continued)

$$F\ (6B)\qquad \underset{(FBE_{6B})}{\underline{\text{New Nonbase Employment in Remainder of Community}}} = \underset{(FBE_{3})}{\underline{\text{New Nonbase Employment}}} - \underset{(FBE_{6A})}{\underline{\text{New Nonbase Employment in City}}}$$

$$\underset{(FBE_{6B})}{\underline{\qquad\qquad\qquad\qquad}} \qquad \underset{(FBE_{3})}{\underline{\qquad\qquad\qquad\qquad}} - \underset{(FBE_{6A})}{\underline{\qquad\qquad\qquad\qquad}}$$

Source of Data

FBE_3 - Formula 3

SF_2 - Standard factor, Section 1

FORMULA #7
NEW EMPLOYMENT BY AREA

New employment in both the base and nonbase sectors has been calculated in Formula #1 and #2, and distributed to the city and remainder of the community in Formula #5 and #6. This formula summarizes those results for use later in this section.

	New Base		New Nonbase		Total New Employment
F (7A) City	________ (FBE_{5A})	+	________ (FBE_{6A})	=	________ (FBE_{7A})
F (7B) Remainder of Community	________ (FBE_{5B})	+	________ (FBE_{6B})	=	________ (FBE_{7B})
F (7C) Total Community	________ (C_1)	+	________ (FBE_3)	=	________ (FBE_7)

Source of Data:

C_1 - Company input data, Chapter IV
FBE_3 - Formula 3
FBE_{5A-B} - Formula 5
FBE_{6A-B} - Formula 6

FORMULA #8
NEW HOUSEHOLDS

The number of new households in the community is not the same as number of new employees. Virtually all base employment will be by the first wage-earner in the family, but a significant portion of non-base employment will be by the second (or third) family wage-earner. For purposes of this analysis a ratio of employees per household is assumed to project the number of new households in the community and in the city:

F (8)
$$\frac{\text{New Households in Community}}{(FPO_1)} = \frac{\text{New Employment in Community}}{(FBE_7)} \div \frac{\text{Average Number of Employees/Household}}{(SF_3)}$$

$$\frac{\qquad\qquad}{(FPO_1)} = \frac{\qquad\qquad}{(FBE_7)} \div \frac{\qquad\qquad}{(SF_3)}$$

F (8A)
$$\frac{\text{New Household in City}}{(FPO_{1A})} = \frac{\text{New Employment in City}}{(FBE_{7A})} \div \frac{\text{Average Number of Employees/Household}}{(SF_3)}$$

$$\frac{\qquad\qquad}{(FPO_{1A})} = \frac{\qquad\qquad}{(FBE_{7A})} \div \frac{\qquad\qquad}{(SF_3)}$$

Formula 8 (Continued)

$$F\ (8B)\quad \frac{\text{New Households in Remainder of the Community}}{(FPO_{1B})} = \frac{\text{New Employment in Remainder of Community}}{(FBE_{7B})} \div \frac{\text{Average Number of Employees/Household}}{(SF_3)}$$

$$\underset{(FPO_{1B})}{\underline{\hspace{4cm}}} = \underset{(FBE_{7B})}{\underline{\hspace{4cm}}} \div \underset{(SF_3)}{\underline{\hspace{4cm}}}$$

Alternate calculation (as check)

$$F\ (8C)\quad \frac{\text{New Households in Community}}{(FPO_1)} = \frac{\text{New Households in City}}{(FPO_{1A})} + \frac{\text{New Households in Remainder of Community}}{(FPO_{1B})}$$

$$\underset{(FPO_1)}{\underline{\hspace{4cm}}} = \underset{(FPO_{1A})}{\underline{\hspace{4cm}}} + \underset{(FPO_{1B})}{\underline{\hspace{4cm}}}$$

Sources of Data

FBE_{7-7B} - Formula 7
SF_3 - Standard factor, Section 1

FORMULA #9
TOTAL HOUSEHOLDS

The total number of households is calculated by adding the projected number of new households to the existing number of households.

F(9)

$$\underset{(FPO_2)}{\underline{\text{Total Households in Community}}} = \underset{(FPO_1)}{\underline{\text{New Households in Community}}} + \underset{(IPO_1)}{\underline{\text{Existing Households in Community}}}$$

$$\underset{(FPO_2)}{\underline{\hspace{5cm}}} = \underset{(FPO_1)}{\underline{\hspace{5cm}}} + \underset{(IPO_1)}{\underline{\hspace{5cm}}}$$

F(9A)

$$\underset{(FPO_{2A})}{\underline{\text{Total Households in city}}} = \underset{(FPO_{1A})}{\underline{\text{New Households in City}}} + \underset{(IPO_{1A})}{\underline{\text{Existing Households in City}}}$$

$$\underset{(FPO_{2A})}{\underline{\hspace{4cm}}} = \underset{(FPO_{1A})}{\underline{\hspace{4cm}}} + \underset{(IPO_{1A})}{\underline{\hspace{4cm}}}$$

F(9B)

$$\underset{(FPO_{2B})}{\underline{\begin{array}{c}\text{Total Households in}\\ \text{Remainder of Community}\end{array}}} = \underset{(FPO_{1B})}{\underline{\begin{array}{c}\text{New Households in}\\ \text{Remainder of Community}\end{array}}} + \underset{(IPO_1\ -\ IPO_{1A})}{\underline{\begin{array}{c}\text{Existing Households in}\\ \text{Remainder of Community}\end{array}}}$$

$$\underset{(FPO_{2B})}{\underline{\hspace{4cm}}} = \underset{(FPO_{1B})}{\underline{\hspace{4cm}}} + \underset{(IPO_1\ -\ IPO_{1A})}{\underline{\hspace{4cm}}}$$

Source of Data:

FPO_{1-1B} - Formula 8
IPO_{1-1A} - Input data, Section 2

FORMULA #10
NEW POPULATION

New population in the community is projected by applying an average household size to the projected number of households. Allocation among city and remainder of community is according to the ratio of households.

F(10)	New Population in Community (FPO_3)	=	New Households in Community (FPO_1)	x	Average Household Size (IPO_2)
	__________ (FPO_3)	=	__________ (FPO_1)	x	__________ (IPO_2)
F(10A)	New Population in City (FPO_{3A})	=	New Households in City (FPO_{1A})	x	Average Household Size (IPO_2)
	__________ (FPO_{3A})	=	__________ (FPO_{1A})	x	__________ (IPO_2)
F(10B)	New Population in Remainder of Community (FPO_{3B})	=	New Households in Remainder of Community (FPO_{1B})	x	Average Household Size (IPO_2)
	__________ (FPO_{3B})	=	__________ (FPO_{1B})	x	__________ (IPO_2)

Source of Data:

FPO_{1-1B} - Formula 8
IPO_2 - Input data, Section 2

FORMULA #11
TOTAL POPULATION

The total population for the community (and city within it) is calculated by adding the projected new population to the present population.

F(11) Total Population in Community (FTP) = New Population in Community (FPO_3) + Existing Population in Community (IPO_3)

__________ (FTP) = __________ (FPO_3) + __________ (IPO_3)

F(11A) Total Population in City (FTP_1) = New Population in City (FPO_{3A}) + Existing Population in City (IPO_{3A})

__________ (FTP_1) = __________ (FPO_{3A}) + __________ (IPO_{3A})

F(11B) Total Population in Remainder of Community (FTP_2) = New Population in Remainder of Community (FPO_{3B}) + Existing Population in Remainder of Community (IPO_{3B})

__________ (FTP_2) = __________ (FPO_{3B}) + __________ (IPO_{3B})

Source of Data:

FPO_{3-3B} - Formula 10
IPO_{3-3B} - Input data, Section 2

Formula 11 (Continued)
AVERAGE HOUSEHOLD SIZE

Average size can be computed for the total population in the community. This will be close to the figure for average household size for new households (IPO_2) in Formula 10.

F (11C) $\frac{\text{Average Household Size in Community}}{(FPO_4)} = \frac{\text{Total Population in Community}}{(FTP)} \div \frac{\text{Total Households in Community}}{(FPO_2)}$

$$\underset{(FPO_4)}{\underline{\qquad\qquad\qquad}} = \underset{(FTP)}{\underline{\qquad\qquad\qquad}} \div \underset{(FPO_2)}{\underline{\qquad\qquad\qquad}}$$

F (11D) $\frac{\text{Average Household Size in City}}{(FPO_{4A})} = \frac{\text{Total Population in City}}{(FTP_1)} \div \frac{\text{Total Households in City}}{(FPO_{2A})}$

$$\underset{(FPO_{4A})}{\underline{\qquad\qquad\qquad}} = \underset{(FTP_1)}{\underline{\qquad\qquad\qquad}} \div \underset{(FPO_{2A})}{\underline{\qquad\qquad\qquad}}$$

F (11E) $\frac{\text{Average Household Size in Remainder of Community}}{(FPO_{4B})} = \frac{\text{Total Population in Remainder of Community}}{(FTP_2)} \div \frac{\text{Total Households in Remainder of Community}}{(FPO_{2B})}$

$$\underset{(FPO_{4B})}{\underline{\qquad\qquad\qquad}} = \underset{(FTP_2)}{\underline{\qquad\qquad\qquad}} \div \underset{(FPO_{2B})}{\underline{\qquad\qquad\qquad}}$$

Source of Data

$FPO_{2\text{ - }2B}$ - Formula 9

FORMULA #12
NEW STUDENTS IN PUBLIC SCHOOL

Added enrollment of children in public school is projected for the community as a whole.

$$F(12)\quad \frac{\text{New Students in Public School}}{(FSP_1)} = \frac{\text{New Population in Community}}{(FPO3)} \times \frac{\text{\% of School Age Students in Population}}{(ISP_1)}$$

$$\underset{(FSP_1)}{\rule{4cm}{0.4pt}} = \underset{(FPO3)}{\rule{4cm}{0.4pt}} \times \underset{(ISP_1)}{\rule{5cm}{0.4pt}}$$

$$F(12A)\quad \frac{\text{New Students in Elementary School}}{(FSP_{1A})} = \frac{\text{New Students in School}}{(FSP_1)} \times \frac{\text{\% of Elementary School Age Students in School System}}{(ISP_2)}$$

$$\underset{(FSP_{1A})}{\rule{4cm}{0.4pt}} = \underset{(FSP_1)}{\rule{4cm}{0.4pt}} \times \underset{(ISP_2)}{\rule{5cm}{0.4pt}}$$

$$F(12B)\quad \frac{\text{New Students in High School}}{(FSP_{1B})} = \frac{\text{New Students in School}}{(FSP_1)} - \frac{\text{New Students in Elementary School}}{(FSP_{1A})}$$

$$\underset{(FSP_{1B})}{\rule{4cm}{0.4pt}} = \underset{(FSP_1)}{\rule{4cm}{0.4pt}} - \underset{(FSP_{1A})}{\rule{5cm}{0.4pt}}$$

Source of Data:

FPO_3 - Formula 10
ISP_{1-2} - Input data, Section 2

FORMULA #13
NEW INCOME IN COMMUNITY

New income in the community is calculated on the basis of wages for new base and nonbase employment. An alternative is to multiply new base income by an income multiplier which should account for new nonbase income, new transfer payments, and new proprietors income.

$$F(13)\quad \underset{(FYO)}{\underline{\text{Total Income of New Population}}} = \underset{(C_1)}{\underline{\text{New Base Employment}}} \times \underset{(C_2)}{\underline{\text{Average Wage of Base Employees}}} + \underset{(FBE_3)}{\underline{\text{New Non-base Employment}}} \times \underset{(IYN)}{\underline{\text{Average Wage of Nonbase Employees}}}$$

$$\underset{(FYO)}{\underline{\qquad\qquad}} = \underset{(C_1)}{\underline{\qquad\qquad}} \times \underset{(C_2)}{\underline{\qquad\qquad}} + \underset{(FBE_3)}{\underline{\qquad\qquad}} \times \underset{(IYN)}{\underline{\qquad\qquad}}$$

Alternate Approach:

$$F(13A)\quad \underset{(FYO)}{\underline{\text{Total Income of New Population}}} = \underset{(C_1)}{\underline{\text{New Base Employment}}} \times \underset{(C_2)}{\underline{\text{Average Wage of Base Employee's}}} \times \underset{(SF_4)}{\underline{\text{Income Multiplier}}}$$

$$\underset{(FYO)}{\underline{\qquad\qquad}} = \underset{(C_1)}{\underline{\qquad\qquad}} \times \underset{(C_2)}{\underline{\qquad\qquad}} \times \underset{(SF_4)}{\underline{\qquad\qquad}}$$

Source of Data:

C_1 - Company input data
C_2 - Company input data
FBE_3 - Formula 3
IYN - Input data, Section 2
SF_4 - Standard factor, Section 1

FORMULA #14
MEAN INCOME OF NEW HOUSEHOLDS AND AVERAGE INCOME OF ALL HOUSEHOLDS

With an average of more than one employee per household (See Formula 8), mean income from wages per household will be higher than the average wage per employee.

F(14)

$$\underset{(FYH)}{\underline{\text{Mean Income of New Households}}} = \underset{(FYO)}{\underline{\text{Total Income of New Population}}} \div \underset{(FPO_1)}{\underline{\text{New Households in Community}}}$$

$$\underset{(FYH)}{\underline{\hspace{6cm}}} = \underset{(FYO)}{\underline{\hspace{3cm}}} \div \underset{(FPO_1)}{\underline{\hspace{3cm}}}$$

F(14A)

$$\underset{(FYH_1)}{\underline{\text{Average Household Income}}} = \left(\underset{(FYO)}{\underline{\text{Total Income of New Population}}} + \underset{(IYO)}{\underline{\text{Total Income of Current Population}}} \right) \div \underset{(FPO_2)}{\underline{\text{Total Households in Community}}}$$

$$\underset{(FYH_1)}{\underline{\hspace{5cm}}} = \left(\underset{(FYO)}{\underline{\hspace{3cm}}} + \underset{(IYO)}{\underline{\hspace{3.5cm}}} \right) \div \underset{(FPO_2)}{\underline{\hspace{3.5cm}}}$$

Source of Data:

FYO - Formula 13
FPO_1 - Formula 8
FPO_2 - Formula 9
IYO - Input data, Section 2

FORMULA #15
NEW RETAIL SALES

Retail sales are estimated based on the total new income and the percentage spent on retail. The share spent in the community varies according to the capture rate, i.e., the ability of the community to serve residents against outside competition. This capture date is directly related to the nonbase employment ratio of Exhibit III.

F(15)

$$\underset{\text{(FRS)}}{\underline{\text{New Retail Sales}}} = \underset{\text{(FYO)}}{\underline{\text{Total Income of New Population}}} \times \underset{(SF_5)}{\underline{\text{Percentage Spent on Retail Sales}}} \times \underset{\text{(FCR)}}{\underline{\text{Capture Rate}}}$$

$$\underset{\text{(FRS)}}{\underline{\hspace{3cm}}} = \underset{\text{(FYO)}}{\underline{\hspace{3cm}}} \times \underset{(SF_5)}{\underline{\hspace{3cm}}} \times \underset{\text{(FCR)}}{\underline{\hspace{3cm}}}$$

F(15A)

$$\underset{\text{(FCR)}}{\underline{\text{Capture Rate}}} = 30\% \times \left(\frac{\text{Nonbase/Base Employment Ratio}}{(SF_1)} + 1 \right)$$

$$\underset{\text{(FCR)}}{\underline{\hspace{3cm}}} = 30\% \times \left(\frac{\hspace{5cm}}{(SF_1)} + 1 \right)$$

Source of Data:

FYO - Formula 13
SF_1 - Standard factor, Section 1
SF_5 - Standard factor, Section 1

FORMULA #16
TOTAL RETAIL SALES

Total retail sales are projected by adding new retail sales to present retail sales.

F(16) Total Retail Sales (FRT) = New Retail Sales (FRS) + Existing Retail Sales (IRS)

________ (FRT) = ________ (FRS) + ________ (IRS)

Source of Data:

FRS - Formula 15
IRS - Input data, Section 2

FORMULA #17
TOTAL WHOLESALE SALES

Wholesale sales are projected as a ratio to the retail sales calculated in Formula #16 plus sales to the coal utilization facility

F(17) $$\underset{\text{(FWT)}}{\underline{\text{Total Wholesale Sales}}} = \underset{\text{(FRT)}}{\underline{\text{Total Retail Sales}}} \times \underset{(SF_6)}{\underline{\text{Ratio of Wholesale to Retail}}} + \underset{(C_3)}{\underline{\text{Local Sales to Company}}}$$

$$\underset{\text{(FWT)}}{\underline{\hspace{4cm}}} = \underset{\text{(FRT)}}{\underline{\hspace{3.5cm}}} \times \underset{(SF_6)}{\underline{\hspace{5cm}}} + \underset{(C_3)}{\underline{\hspace{4.5cm}}}$$

Source of Data:

C_3 - Company input data, Chapter IV
FRT - Formula 16
SF_6 - Standard factor, Section 1

FORMULA #18
NEW DEMAND FOR HOUSING UNITS

The number of new housing units required is projected to provide a unit for each new household plus a normal percentage of vacant units. This is gross demand since vacant units are not yet deducted.

F(18) $$\underset{(FHD_1)}{\underline{\text{New Demand for Housing Units}}} = \underset{(FPO_1)}{\underline{\text{Number of New Households}}} \div \underset{(IHO)}{\underline{\text{Normal Percentage of Total Housing Stock Occupied}}}$$

$$\underset{(FHD_1)}{\underline{\qquad\qquad\qquad\qquad}} = \underset{(FPO_1)}{\underline{\qquad\qquad\qquad\qquad}} \div \underset{(IHO)}{\underline{\qquad\qquad\qquad\qquad}}$$

Source of Data

FPO_1 - Formula 8,
IHO - Input data, Section 2

FORMULA #19
NEW DEMAND FOR SINGLE FAMILY HOUSING

The new demand for single family homes will equal the total new demand times the percentage of demand which is for single family minus existing vacant units. At the Navajo Generating Station the percentage single family is expected to be 68%.

$$F(19)\quad \underset{(FHD_2)}{\underline{\text{New Demand for Single Family Homes}}} = \underset{(FHD_1)}{\underline{\text{New Demand for Housing Units}}} \times \underset{(IHS_1)}{\underline{\text{Percentage of Single Family}}} - \underset{(IHV_1)}{\underline{\text{Vacant Single Family Units}}}$$

$$\underset{(FHD_2)}{\underline{\qquad\qquad\qquad}} = \underset{(FHD_1)}{\underline{\qquad\qquad\qquad\qquad}} \times \underset{(IHS_1)}{\underline{\qquad\qquad}} - \underset{(IHV_1)}{\underline{\qquad\qquad}}$$

Source of Data:

FHD_1 - Formula 18
IHS_1 - Input data, Section 2
IHV_1 - Input data, Section 2

FORMULA #20
NEW DEMAND FOR MULTI-FAMILY HOUSING

The new demand for multi-family units will equal the total new demand times the percentage of demand which is for multi-family minus the existing vacant units. At the Navajo Generating Station the percentage multi-family is expected to be 5%.

$$\text{F(20)}\quad \frac{\text{New Demand for Multi-family Units}}{(FHD_3)} = \frac{\text{New Demand for for Housing Units}}{(FHD_1)} \times \frac{\text{Percentage of Multi-family}}{(IHS_2)} - \frac{\text{Vacant Multi-Family Units}}{(IHV_2)}$$

$$\frac{\underline{\hspace{4cm}}}{(FHD_3)} = \frac{\underline{\hspace{4cm}}}{(FHD_1)} \times \frac{\underline{\hspace{3cm}}}{(IHS_2)} - \frac{\underline{\hspace{4cm}}}{(IHV_2)}$$

Source of Data:

FHD_1 - Formula 18
IHS_2 - Input data, Section 2
IHV_2 - Input data, Section 2

FORMULA #21
NEW DEMAND FOR MOBILE HOMES

The new demand for mobile homes will equal the total new demand times the percentage of demand which for mobile homes. It is anticipated there are no vacant mobile homes. At the Navajo Generating Station the percentage mobile homes is expected to be 27%.

Mobile homes will be required to be purchased in the community only by those who do not bring their unit. For purposes of this analysis, the total mobile home need will be calculated. This may be different than mobile home sites because of the potential availability of vacant sites.

F(21) New Demand for Mobile Homes (FHD_4) = New Demand for Housing (FHD_1) x Percentage of Mobile Homes (IHS_3)

________ (FHD_4) = ________ (FHD_1) x ________ (IHS_3)

Source of Data:

FHD_1 - Formula 18
IHS_3 - Input data, Section 2

FORMULA #22
NEW DEMAND FOR MOBILE HOME PARK SITES

The demand for mobile houses is calculated in terms of pads or sites within mobile home parks. Occupants of mobile homes then have the option of buying locally, buying elsewhere, or moving in the unit they already own.

F (22) New Demand for Mobile Home Park Sites (FHD_5) = New Demand for Mobile Homes (FHD_4) - Vacant Mobile Home Park Sites (HHV_3)

________ (FHD_5) = ________ (FHD_4) - ________ (HHV_3)

Source of Data

FHD_4 - Formula 21
HHV_3 - Input data, Section 2

FORMULA #23
TOTAL HOUSING UNITS

Total housing units are calculated by adding new demand to existing units.

SUMMARY OF HOUSING UNITS

		Existing*		New		Total
F(23A)	Single Family	______ (IHD$_1$)	+	______ (FHD$_2$)	=	______ (FHT$_2$)
F(23B)	Multi-Family	______ (IHD$_2$)	+	______ (FHD$_3$)	=	______ (FHT$_3$)
F(23C)	Mobile Home	______ (IHD$_3$)	+	______ (FHD$_4$)	=	______ (FHT$_4$)
F(23)	Total	______ (FHT$_1$)	+	______ (FHD)	=	______ (FHT)

Sources of Data:

FHD_2 - Formula 19
FHD_3 - Formula 20
FHD_4 - Formula 21
IHD_{1-3} - Input data, Section 2

* Occupied and Standard Vacant

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FORMULA #24
SUMMARY OF PERCENTAGE INCREASES

In this table, it is possible to calculate and compare the increases in population, employment, retail sales, and housing resulting from the addition of new base employment in the community.

F(24A)	Increase in Total Employment (FIE)	=	Total New Employment (FBE_{4B})	÷	Total Existing Employment (FBE_{4A})
	______ (FIE)	=	______ (FBE_{4B})	–	______ (FBE_{4A})
F(24B)	Increase in Population in Community (FIP)	=	New Population in Community (FPO_3)	÷	Existing Population in Community (IPO_3)
	______ (FIP)	=	______ (FPO_3)	÷	______ (IPO_3)
E(24C)	Increase in Population City (FIP_1)	=	New Population in City (FPO_{3A})	÷	Existing Population in City (IPO_{3A})
	______ (FIP_1)	=	______ (FPO_{3A})	÷	______ (IPO_{3A})
F(24D)	Increase in Retail Sales (FIS)	=	New Retail Sales (FRS)	÷	Present Retail Sales (IRS)
	______ (FIS)	=	______ (FRS)	÷	______ (IRS)

Formula 24 (Continued)

F(24E)

$$\frac{\text{Increase in Housing}}{(FIH)} = \frac{\text{New Demand for Housing Units}}{(FHD)} \div \frac{\text{Existing Housing Unit}}{(FHT_1)}$$

$$\frac{\qquad\qquad}{(FIH)} = \frac{\qquad\qquad}{(FHD)} \div \frac{\qquad\qquad}{(FHT_1)}$$

Sources of Data:

FBE_{4A} - Formula 4
FBE_{4B} - Formula 4
FPO_3 - Formula 10
IPO_3 - Input data, Section 2
FPO_{3A} - Formula 10A
IPO_{3A} - Input data, Section 2
FRS - Formula 14
IRS - Input data, Section 2
FHD - Formula 23
FHT_1 - Formula 23

VI. CAPITAL REQUIREMENTS

The purpose of this section is to determine the total capital requirements of the community resulting from the creation of new base and nonbase employment and the resulting new population in the community. The four major areas covered are:

- Infrastructure
- Housing
- Public Facilities
- Commercial

The responsibility for these capital needs lies with both the public and private sectors. Within the public sector, responsibility is divided among the state, county, city and school district. For purposes of this analysis, the following areas of responsibility are assigned.

State: State Highways
(Other aid may come to county, city and school districts as subventions or grants)

County: Community-wide functions

- County Roads
- Hospital
- Health Clinic
- Criminal Justice (Sheriff, Courts, Jail)
- Governmental offices

City: Urban-type Functions*

- Water
- Sewage Disposal
- Solid Waste Disposal**
- Fire
- Police
- Library
- Parks
- Governmental Offices

School District:

- Elementary Schools
- High Schools

Within the private sector, there are three major types of investment required:

Utilities:

- Electricity
- Natural Gas
- Telephone

Housing:

- Single Family
- Multi-Family
- Mobile Homes (and mobile home pads)
- Group Quarters

Commercial:

- Retail
- Wholesale
- Office
- Hotel/Motel
- Commercial Recreation

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* For purposes of this analysis, it is assumed that these services will not be publicly provided outside cities. Outside, water, sewage disposal and solid waste disposal will be up to individual developers or home owners. Fire service will be by volunteers. Police will be by sheriff. There will be no library or parks.

** The cost of a land-fill is included under solid waste operating cost, assuming lease of land rather than purchase.

To the greatest extent possible, it is desirable to have estimates of capital requirements made by the public agencies or private organizations which have available data or plans and will have responsibility for capital construction. In this category can be placed:

State Highways	State Highway Department
County Roads	County Road Department
Electricity	Electric Utility
Natural Gas	Natural Gas Utility
Telephone	Telephone Utility
Classroom	School District(s)

Other capital needs will be provided by city and county governments and their plans and projections should be used if applicable, but it is more likely that estimates will have to be made based on factors of population and cost. This manual assumes that except for a few cases, the existing city will be small or the new town not yet built so there is no staff available to project costs, and no plans or studies have been made to date on capital requirements.

Certain capital costs are normally associated with, and included in the cost of housing. For purposes of this analysis, the cost of housing will include:

- Acquisition of land
- Site preparation
- Construction of unit
- Share of local street to serve unit
- Water line from street to unit
- Sewer line from unit to street

Other capital costs to construct a single-family subdivision, multi-family building or mobile home park, such as circulation streets, water and sewer lines in streets and neighborhood parks are included in the overall city costs for those categories. Depending on local regulations, however, they may be a responsibility of the developer.

Finally, these estimates of cost are based on serving the new population of the city/community, not the coal utilization facilities. This manual assumes that these facilities will provide their own:

- Water
- Sewage disposal
- Electricity
- Natural gas
- Fire protection
- Facility security
- First aid

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FORMULA #26
STATE HIGHWAYS

The need for and cost of the construction of new state highways or the widening/upgrading of existing ones should be determined, if possible, by the State Highway Department. The researcher should provide the department with:

- Locations of facility and city
- Projected population of city
- Projected population of community
- Plant traffic - construction
  - operation

F(26) $\frac{\text{Cost of State Highways}}{(FRC_1)}$ = State estimate

$\frac{\_\_\_\_\_\_\_\_}{(FRC_1)}$ = ________

Alternative Method:

Researcher may estimate miles of state highway needs and apply state-wide cost factors, as follows:

F(26A) $\frac{\text{New Construction Cost}}{(FRC_{1A})} = \frac{\text{Miles of New Highway}}{(IRU_1)} \times \frac{\text{Cost per Mile}}{(IRC_1)}$

$\frac{\_\_\_\_\_\_\_\_}{(FRC_{1A})} = \frac{\_\_\_\_\_\_\_\_}{(IRU_1)} \times \frac{\_\_\_\_\_\_\_\_}{(IRC_1)}$

FORMULA #26 (Continued)

F(26B) Upgrading Construction Cost (FRC_{1B}) = Miles of Existing Highway (IRU_2) x Cost per Mile (IRC_2)

__________ (FRC_{1B}) = __________ (IRU_2) x __________ (IRC_2)

F(26) Cost of State Highways (FRC_1) = New Construction Cost (FRC_{1A}) + Upgrading Construction Cost (FRC_{1B})

__________ (FRC_1) = __________ (FRC_{1A}) + __________ (FRC_{1B})

Source of Data:

IRC_1 - Input data, Section 3
IRC_2 - Input data, Section 3
IRU_1 - Input data, Section 3
IRU_2 - Input data, Section 3

FORMULA #27
COUNTY ROADS

County roads include all those roads and highways outside the city limits and not included in the state highway system. Included within this category could be the following items:

- Road to connect proposed facility to existing highway (this is generally the responsibility of the applicant company)

- Road to connect facility to new city

- General upgrading of existing roads to handle increased population and traffic

The need for, and cost of, the construction of new or upgraded roads should be determined, if possible, by the County Road Department. The researcher should provide the department with:

- Locations of plant and city
- Projected population of city
- Projected population of county
- Projected traffic to plant

The applicant company should have estimates of the cost of the road from the plant to an existing road:

$$\frac{\text{Cost of Plant Road}}{(FRC_2)} = \text{Company estimate}$$

Alternate Method #1

$$\frac{\text{Cost of Plant Road}}{(FRC_2)} = \text{County estimate}$$

Alternate Method #2

$$\frac{\text{Cost of Plant Road}}{(FRC_2)} = \text{Miles of Road x Cost per Mile}$$

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FORMULA #27 (Continued)

The need for a road from the city to the plant road will be different in each situation.

F(27A)

$$\underset{(FRC_{2A})}{\underline{\text{Cost of City/Plant Road}}} = \text{County estimate}$$

$$\underset{(FRC_{2A})}{\underline{\text{Cost of City/Plant Road}}} = \underset{(IRU_{3})}{\underline{\text{Miles of Road}}} \times \underset{(IRC_{3})}{\underline{\text{Cost per Mile}}}$$

$$\underset{(FRC_{2A})}{\underline{\hspace{6cm}}} = \underset{(IRU_{3})}{\underline{\hspace{3cm}}} \times \underset{(IRC_{3})}{\underline{\hspace{4cm}}}$$

The need for other new county roads or the upgrading of existing ones can be generalized from projected population.

F(27B)

$$\underset{(FRC_{2B})}{\underline{\text{Costs of Other County Roads}}} = \underset{(FPO_{3})}{\underline{\text{New Population in Community}}} \times \underset{(IRC_{4})}{\underline{\text{Cost per Capita}}}$$

$$\underset{(FRC_{2B})}{\underline{\hspace{6cm}}} = \underset{(FPO_{3})}{\underline{\hspace{6cm}}} \times \underset{(IRC_{4})}{\underline{\hspace{3.5cm}}}$$

F(27)

$$\underset{(FRC_{3})}{\underline{\text{Total County Road Costs}}} = \underset{(FRC_{2A})}{\underline{\text{Cost of City/Plant Road}}} + \underset{(FRC_{2B})}{\underline{\text{Cost of Other County Roads}}}$$

$$\underset{(FRC_{3})}{\underline{\hspace{5cm}}} = \underset{(FRC_{2A})}{\underline{\hspace{5cm}}} + \underset{(FRC_{2B})}{\underline{\hspace{6cm}}}$$

Source of Data:

IRU_3 - Input data, Section 3
IRC_{3-4} - Input data, Section 3
FPO_3 - Formula 10

FORMULA #28
CITY STREETS

City streets are all those streets within the city except state highways which may run through town (state responsibility) and local subdivision streets serving individual units (covered under housing). Costs include some new streets, widening and upgrading of existing streets and necessary traffic controls. These costs can best be estimated by applying a factor to the total projected population of the city.

F(28) City Street Costs (FRC_4) = Total City Population (FTP_1) x Cost per Capita (IRC_5)

________ (FRC_4) = ________ (FTP_1) x ________ (IRC_5)

Source of Data:

IRC_5 - Input data, Section 3
FTP_1 - Formula 11

FORMULA #29
WATER SYSTEM

The water system consists of two major elements:

(1) Water supply (wells/reservoir and line to city) - estimates of costs will depend on the local situation. If possible, these should be made by the city water department or state water agency.

F(29A) $\underset{(FWC_{1A})}{\underline{\text{Water Supply Cost}}} = \text{City or state estimate}$

$\underset{(FWC_{1A})}{\underline{\qquad\qquad\qquad}} = \underline{\qquad\qquad\qquad}$

(2) Water Distribution (lines within city to serve business and residents). These costs can be estimated on a per unit basis.

F(29B) $\underset{(FWC_{1B})}{\underline{\text{Water Distribution cost}}} = \underset{(FHD)\ \times\ (SF_2)}{\underline{\text{New Residential Units}}} \times \underset{(IWC_1)}{\underline{\text{Costs per Unit}}}$

$\underset{(FWC_{1B})}{\underline{\qquad\qquad\qquad}} = \underset{(FHD_4)\ \times\ (SF_2)}{\underline{\qquad\qquad\qquad}} \times \underset{(IWC_1)}{\underline{\qquad\qquad}}$

F(29) $\underset{(FWC)}{\underline{\text{Water System Cost}}} = \underset{(FWC_{1A})}{\underline{\text{Water Supply Cost}}} + \underset{(FWC_{1B})}{\underline{\text{Water Distribution Cost}}}$

$\underset{(FWC)}{\underline{\qquad\qquad\qquad}} = \underset{(FWC_{1A})}{\underline{\qquad\qquad\qquad}} + \underset{(FWC_{1B})}{\underline{\qquad\qquad\qquad}}$

Source of Data:

FHD - Formula 23
SF_2 - Standard factor, Section 1
IWC_1 - Input data, Section 3

FORMULA #30
SEWAGE DISPOSAL

Sewage disposal costs are estimated based on the assumption that the city will need to provide a system which meets health and pollution standards of the state. The two major elements are a collection system and treatment plant which can be combined for estimating purposes. The cost of sewage disposal can be estimated by the state but more likely an estimate will be made based on number of units to be served.

$$\frac{\text{Number of Units to Be Served}}{\text{(FDU)}} = \begin{array}{l}\text{Number of new units-(FHD)-(if existing system)}\\ \text{or Number of total units-(FHT)-(if no existing system)}\end{array}$$

$$\frac{\rule{6cm}{0.4pt}}{\text{(FDU)}} = \frac{\rule{7cm}{0.4pt}}{\text{(FHD, or FHT)}}$$

$$\text{F (30)}\quad \frac{\text{Sewage Disposal Cost}}{\text{(FDC)}} = \frac{\text{Number of Units to Be Served}}{\text{(FDU)}} \text{ x } \frac{\text{Cost per Unit}}{\text{(IDC)}}$$

$$\frac{\rule{4.5cm}{0.4pt}}{\text{(FDC)}} = \frac{\rule{6cm}{0.4pt}}{\text{(FDU)}} \text{ x } \frac{\rule{3cm}{0.4pt}}{\text{(IDC)}}$$

Alternate Method:

$$\text{F (30A)}\quad \frac{\text{Sewage Disposal Cost}}{\text{(FDC)}} = \text{State estimate}$$

Source of Data:

FHD - Formula 23
FHT - Formula 23
IDC - Input data, Section 3

FORMULA # 31
UTILITIES

Utilities to be provided include electricity, natural gas and telephone. Estimates are made for the entire community. The best source of cost estimates is the pertinent utility itself. Factors to be considered include new population, new households and area to be covered.

F (31)

$$\frac{\text{Total Utility Cost}}{(\text{FEG})} = \frac{\text{Electric Cost}}{(\text{FEG}_1)} + \frac{\text{Natural Gas Cost}}{(\text{FEG}_2)} + \frac{\text{Telephone Cost}}{(\text{FEG}_3)}$$

$$\frac{\qquad\qquad\qquad}{(\text{FEG})} = \frac{\qquad\qquad\qquad}{(\text{FEG}_1)} + \frac{\qquad\qquad\qquad}{(\text{FEG}_2)} + \frac{\qquad\qquad\qquad}{(\text{FEG}_3)}$$

F (31A) $\frac{\text{Electric Cost}}{(\text{FEG}_1)}$ = Utility estimate

F (31B) $\frac{\text{Natural Gas Cost}}{(\text{FEG}_2)}$ = Utility estimate

F (31C) $\frac{\text{Telephone Cost}}{(\text{FEG}_3)}$ = Utility estimate

Alternate Method:

$$\frac{\text{Electric Cost}}{(\text{FEG}_1)} = \frac{\text{Number of New Units}}{(\text{FHD})} \times \frac{\text{Cost per unit}}{(\text{IEG}_1)}$$

$$\frac{\qquad\qquad\qquad}{(\text{FEG}_1)} = \frac{\qquad\qquad\qquad}{(\text{FHD})} \times \frac{\qquad\qquad\qquad}{(\text{IEG}_1)}$$

FORMULA #31 (Continued)

Natural Gas Cost (FEG_2) = Number of New Units (FHD) x Cost per Unit (IEG_2)

________ (FEG_2) = ________ (FHD) x ________ (IEG_2)

Telephone Cost (FEG_3) = Number of New Units (FHD) x Cost per Unit (IEG_3)

________ (FEG_3) ________ (FHD) ________ (IEG_3)

Source of Data:

FHD - Formula 23
IEG_{1-3} - Input data, Section 3

FORMULA #32
HOUSING

Housing costs are estimated as the costs required to provide the new housing units identifie as needed in Formula 23.

New Housing Costs:

Single Family housing cost ______________________ (FHC_2)
+
Multi-Family housing cost ______________________ (FHC_3)
+
Mobile Home cost ______________________ (FHC_4)
+
Mobile Home pad cost ______________________ (FHC_5)

F(32) Total New Housing Costs = ______________________ (FHC_1)

Source of Data:

FHC_{2-5} - Formulae 33-37

FORMULA #33
SINGLE FAMILY HOUSING

Single family units are projected to provide the majority of permanent housing. Costs are estimated based on local experience.

F (33) Single Family Housing Cost (FHC_2) = Demand for New Single Family Housing (FHD_2) x Cost per Unit (FHU_1)

________ (FHC_2) = ________ (FHD_2) x ________ (FHU_1)

F (33A) Cost per Unit (FHU_1) = Average Size (in sq. ft.) (IHU_1) x Cost per Square Foot (IHC_1)

________ (FHU_1) = ________ (IHU_1) x ________ (IHC_1)

Alternate Method:

F (33B) Cost per Unit (FHU_1) = Local estimate of average single family unit cost.

Source of Data:

IHU_1 - Input data, Section 3
IHC_1 - Input data, Section 3
FHD_2 - Formula 19

FORMULA #34
MULTI-FAMILY UNITS

Multi-family units are located in duplexes and apartments. Costs are estimated based on local experience.

F(34) Multi-Family Housing Costs (FHC_3) = Demand for New Multi-Family Units (FHD_3) x Cost per Unit (FHU_2)

$\underline{\hspace{4cm}}$ (FHC_3) = $\underline{\hspace{5cm}}$ (FHD_3) x $\underline{\hspace{2cm}}$ (FHU_2)

F(34A) Cost per Unit (FHU_2) = Average Size (in square feet) (IHU_2) x Cost per Square Foot (IHC_2)

$\underline{\hspace{3cm}}$ (FHU_2) = $\underline{\hspace{4cm}}$ (IHU_2) x $\underline{\hspace{3cm}}$ (IHC_2)

Alternate Method:

F(34B) Cost per Unit (FHU_2) = Local estimate of average multi-family unit cost

Source of Data:

FHD_3 - Formula 20
IHU_2 - Input data, Section 3
IHC_2 - Input data, Section 3

FORMULA #35
MOBILE HOMES

The costs of mobile homes consists of two elements:

(1) The mobile home unit itself is assumed to be owned by the occupant. It may be purchased locally or may be the current home of a new family which they move to the community.

(2) Pad in mobile home park or individual site which includes utility service (costs are calculated in next formula)

F (35) Mobile Home Cost (FHC_4) = Demand for New Mobile Homes (FHD_4) x Average Cost per Unit (IHC_3)

________ (FHC_4) = ________ (FHD_4) x ________ (IHC_3)

Source of Data:

FHD_5 - Formula 21
IHC_3 - Input data, Section 3

FORMULA #36
MOBILE HOME PADS

F(36) Mobile home Pad Cost (FHC_5) = Demand for New Pads (FHD_5) x Cost per Pad (IHC_4)

__________ (FHC_5) = __________ (FHD_5) x __________ (IHC_4)

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Source of Data:

FHD_5 - Formula 22
IHC_4 - Input data, Section 3

FORMULA #37
ELEMENTARY SCHOOL

Elementary school costs are estimated based on the number of elementary students projected in the steady state condition. Costs per classroom include all support and general area costs of constructing an elementary school, i.e., the total cost of a school divided by number of classrooms. Consideration is given in this formulae, and for high schools of available and excess capacity within the school district.

F(37)

$$\underset{(FSC_1)}{\underline{\text{Elementary School Cost}}} = \underset{(FSU_1)}{\underline{\text{Number of Elementary Classrooms Required}}} \times \underset{(ISC_1)}{\underline{\text{Cost per Elementary Classroom}}}$$

$$\underset{(FSC_1)}{\underline{\hspace{4cm}}} = \underset{(FSU_1)}{\underline{\hspace{5cm}}} \times \underset{(ISC_1)}{\underline{\hspace{3cm}}}$$

F(37A)

$$\underset{(FSU_1)}{\underline{\text{Number of Elementary Classrooms Required}}} = \left(\underset{(FSP_{1A})}{\underline{\text{Number of New Elementary Students}}} + \underset{(ISP_3)}{\underline{\text{Current Elementary Students}}}\right) \div \underset{(ISP_4)}{\underline{\text{Students per Class}}} - \underset{(ISU_1)}{\underline{\text{Number of Useable Elementary Classrooms}}}$$

$$\underset{(FSU_1)}{\underline{\hspace{2.5cm}}} = \left(\underset{(FSP_{1A})}{\underline{\hspace{2.5cm}}} + \underset{(ISP_3)}{\underline{\hspace{2.5cm}}}\right) \div \underset{(ISP_4)}{\underline{\hspace{2.5cm}}} - \underset{(ISU_1)}{\underline{\hspace{2.5cm}}}$$

Source of Data:

ISC_1 - Input data, Section 3
FSP_{1A} Formula 12A
ISP_3 - Input data, Section 3
ISP_4 - Input data, Section 3
ISU_1 - Input data, Section 3

FORMULA #38
HIGH SCHOOL

High school costs are estimated based on the number of high school students projected in the steady state condition. Costs per classroom include all support and general area costs of constructing a high school.

F(38)

$$\underset{(FSC_2)}{\underline{\text{High School Cost}}} = \underset{(FSU_2)}{\underline{\text{Number of High School Classrooms Required}}} \times \underset{(ISC_2)}{\underline{\text{Cost per High School Classroom}}}$$

$$\underset{(FSC_2)}{\underline{\qquad\qquad\qquad}} = \underset{(FSU_2)}{\underline{\qquad\qquad\qquad}} \times \underset{(ISC_2)}{\underline{\qquad\qquad\qquad}}$$

F(38A)

$$\underset{(FSU_3)}{\underline{\text{Number of High School Classrooms Required}}} = \left(\underset{(FSP_{1B})}{\underline{\text{Number of New High School Students}}} + \underset{(ISP_5)}{\underline{\text{Current High School Students}}}\right) \div \underset{(ISP_6)}{\underline{\text{Students per Class}}} - \underset{(ISU_2)}{\underline{\text{Number of Useable High School Classrooms}}}$$

$$\underset{(FSU_2)}{\underline{\qquad\qquad}} = \left(\underset{(FSP_{1B})}{\underline{\qquad\qquad}} + \underset{(ISP_5)}{\underline{\qquad\qquad}}\right) \div \underset{(ISP_6)}{\underline{\qquad\qquad}} - \underset{(ISU_2)}{\underline{\qquad\qquad}}$$

Sources of Data:

ISC_2 - Input data, Section 3
FSP_{1B} - Formula 12B
ISP_5 - Input data, Section 3
ISP_6 - Input data, Section 3
ISU_2 - Input data, Section 3

FORMULA #39

HOSPITAL

Hospital costs cover the full cost of general hospital services for the community. No differentiation is made as to whether it is public (county) or privately operated. For most communities under consideration, specialized hospital services will be provided in a larger urban center. For many smaller comunities the general hospital may be provided elsewhere in the area, e.g., Billings, Casper or Bismarck. These costs are still accounted for here and methods of payment considered under revenue/cost analysis.

F(39)

$$\frac{\text{Hospital Cost}}{(\text{FMC}_1)} = \frac{\text{Number of Beds Required}}{(\text{FMU})} \times \frac{\text{Cost per Bed}}{(\text{IMC}_1)}$$

$$\frac{\qquad\qquad}{(\text{FMC}_1)} = \frac{\qquad\qquad}{(\text{FMU})} \times \frac{\qquad\qquad}{(\text{IMC}_1)}$$

F(39A)

$$\frac{\text{Number of Beds Required}}{(\text{FMU})} = \frac{\text{Total Population}}{(\text{FTP})} \times \frac{\text{Beds/capita}}{(\text{IMP})} - \frac{\text{Existing Useable Beds}}{(\text{IMU})}$$

$$\frac{\qquad\qquad}{(\text{FMU})} = \frac{\qquad\qquad}{(\text{FTP})} \times \frac{\qquad\qquad}{(\text{IMP})} - \frac{\qquad\qquad}{(\text{IMU})}$$

Sources of Data:

FTP - Formula 11
IMC_1 - Input data, Section 3
IMP - Input data, Section 3
IMU - Input data, Section 3

FORMULA #40
HEALTH CLINIC

Health Clinic costs include all costs associated with constructing facilities for public health, emergency, and out-patient care. These may often be located in more remote parts of the community, or in the city if no general hospital is provided. Costs are estimated on a per capita basis. Assumption is made that there are no existing clinics.

If Hospital in Community:

F(40)

$$\underset{(FMC_2)}{\underline{\text{Health Clinic Cost}}} = \underset{(FTP_2)}{\underline{\text{Total Population of Community Outside City}}} \times \underset{(IMC_2)}{\underline{\text{Cost per Capita}}}$$

$$\underset{(FMC_2)}{\underline{\hspace{4cm}}} = \underset{(FTP_2)}{\underline{\hspace{7cm}}} \times \underset{(IMC_2)}{\underline{\hspace{3cm}}}$$

If Hospital Outside Community:

F(40A)

$$\underset{(FMC_2)}{\underline{\text{Health Clinic Cost}}} = \underset{(FTP)}{\underline{\text{Total Population of Community}}} \times \underset{(IMC_2)}{\underline{\text{Cost per Capita}}}$$

$$\underset{(FMC_2)}{\underline{\hspace{4cm}}} = \underset{(FTP)}{\underline{\hspace{5cm}}} \times \underset{(IMC_2)}{\underline{\hspace{3cm}}}$$

Source of Data:

FTP - Formula 11
FTP_2 - Formula 11B
IMC_2 - Input data, Section 3

FORMULA #41
FIRE STATIONS/EQUIPMENT

Fire station costs are not directly related to population, but vary according to areas to be covered. Many existing cities will have fire stations in use which may suffice for added growth. On the other hand, new growth may require replacement of existing stations or construction of new ones.

Equipment (pumpers and ladder trucks) will also be required, assuming existing equipment is not adequate. Station and equipment needs and costs may be estimated by the city fire department. The alternate method involves use of recognized fire standards.

F(41) Fire Station/Equipment Cost (FFC) = Local estimate

ALTERNATE METHOD:

- One station and one pumper required for low-density, largely residential area located within one-half mile radius.
- Additional station and pumper required if area significantly exceeds circle of 1-1/2 mile radius.
- Ladder truck may be required if area exceeds 3 mile radius, buildings exceed two stories, or total population exceeds 20,000. Would be located in main station.

F(41A) Fire Costs (FFC) = Station Cost + Pumper Cost = Ladder Truck Cost

__________ (FFC) = __________ + __________ = __________

FORMULA #41 (Continued)

Station Cost = (Total Stations Required - Adequate Stations) x Cost per Station

________ = (________ - ________) x ________

Pumper Cost = Total New Pumpers Required x Cost per Pumper

________ = ________ x ________

Ladder Truck Cost = Total New Ladder Trucks Required x Cost per Truck

________ = ________ x ________

FORMULA #42
POLICE STATION

Police station costs are directly related to population size. Needs and costs may be estimated by the city police department. An alternate method is to apply standard costs to total population. The actual space may be constructed separately or as part of a general government, sheriff or fire office.

F(42)

$$\frac{\text{Police Station Cost}}{(FPC_1)} = \text{Local estimate}$$

F(42A)

$$\frac{\text{Police Station Cost}}{(FPC_1)} = \frac{\text{New Population in City}}{(FPO_{3A})} \times \frac{\text{Cost per Capita}}{(IPC)}$$

$$\frac{\rule{3cm}{0.4pt}}{(FFC_1)} = \frac{\rule{3cm}{0.4pt}}{(FPO_{3A})} \times \frac{\rule{3cm}{0.4pt}}{(IPC)}$$

Source of Data:

FPO_{3A} - Formula 10
IPC - Input data, Section 3

FORMULA #43
CRIMINAL JUSTICE

Criminal justice capital costs include sheriff, courts and jail serving the entire community. Costs are estimated based on per capita for the added population in the community.

F(43)

$$\underset{(FJC)}{\underline{\text{Criminal Justice Costs}}} = \underset{(FJC_1)}{\underline{\text{Sheriff Cost}}} + \underset{(FJC_2)}{\underline{\text{Court Cost}}} + \underset{(FJC_3)}{\underline{\text{Jail Cost}}}$$

$$\underset{(FJC)}{\underline{\qquad\qquad\qquad}} = \underset{(FJC_1)}{\underline{\qquad\qquad}} + \underset{(FJC_2)}{\underline{\qquad\qquad}} + \underset{(FJC_3)}{\underline{\qquad\qquad}}$$

F(43A)

$$\underset{(FJC_1)}{\underline{\text{Sheriff Cost}}} = \underset{(FPO_{3B})}{\underline{\begin{array}{c}\text{Added Community}\\ \text{Population Outside Cities}\end{array}}} \times \underset{(IJC_1)}{\underline{\text{Cost per Capita}}}$$

$$\underset{(FJC_1)}{\underline{\qquad\qquad}} = \underset{(FPO_{3B})}{\underline{\qquad\qquad\qquad\qquad}} \times \underset{(IJC_1)}{\underline{\qquad\qquad\qquad}}$$

F(43B)

$$\underset{(FJC_2)}{\underline{\text{Court Cost}}} = \underset{(FPO_3)}{\underline{\text{New Community Population}}} \times \underset{(IJC_2)}{\underline{\text{Cost per Capita}}}$$

$$\underset{(FJC_2)}{\underline{\qquad\qquad}} = \underset{(FPO_3)}{\underline{\qquad\qquad\qquad\qquad}} \times \underset{(IJC_2)}{\underline{\qquad\qquad\qquad}}$$

F(43C)

$$\underset{(FJC_3)}{\underline{\text{Jail Cost}}} = \underset{(FPO_3)}{\underline{\text{New Community Population}}} \times \underset{(IJC_3)}{\underline{\text{Cost per Capita}}}$$

$$\underset{(FJC_3)}{\underline{\qquad\qquad}} = \underset{(FPO_3)}{\underline{\qquad\qquad\qquad\qquad}} \times \underset{(IJC_3)}{\underline{\qquad\qquad\qquad}}$$

Source of Data: FPO_3 - Formula 10
FPO_{3B} - Formula 10_B
IJC_{1-3} - Input data, Section 3

FORMULA #44
LIBRARY

Library costs for space and books are directly related to population. Cost may be estimated by the city or on a pre-capita basis for the new population (if no present library, calculate for total population).

F(44)

$$\underset{(\text{FLC})}{\underline{\text{Library Cost}}} = \underset{(\text{FPO}_{3A})}{\underline{\text{New City Population}}} \times \underset{(\text{ILP})}{\underline{\text{Branch Library per 1000 Population}}} \times \underline{1000} \times \underset{(\text{ILC})}{\underline{\text{Cost per Branch Library}}}$$

$$\underset{(\text{FLC})}{\underline{\hspace{3cm}}} = \underset{(\text{FPO}_{3A})}{\underline{\hspace{4cm}}} \times \underset{(\text{ILP})}{\underline{\hspace{4cm}}} \times \underline{1000} \times \underset{(\text{ILC})}{\underline{\hspace{3.5cm}}}$$

Sources of Data:

FPO_{3A} - Formula 10A
ILP - Input data, Section 3
ILC - Input data, Section 3

FORMULA #45
GOVERNMENT OFFICES

General government office costs can be estimated on the basis of population to be served. Separate calculations are made for the city and community (county).

F(45)	Cost of Community Government Offices (FGC_1)	=	New Population in Community (FPO_3)	x	Cost per Capita (IGC_1)
	__________ (FGC_1)	=	__________ (FPO_3)	x	__________ (IGC_1)
F(45A)	Cost of City Government Offices (FGC_2)	=	New Population in City (FPO_{3A})	x	Cost per Capita (IGC_2)
	__________ (FGC_2)	=	__________ (FPO_{3A})	x	__________ (IGC_2)

Source of Data:

FPO_3 - Formula 10
IGC_1 - Input data, Section 3
FPO_{3A} - Formula 10A
IGC_2 - Input data, Section 3

FORMULA #46
PARKS

Park costs include both the acquisition and development of park property. Acquisition costs vary because of sites chosen, availability of federal or state land, use of flood plains and potential donations. An average cost per acre may be used for estimating purposes. Development costs may be estimated more surely on a per acre basis. Included in these costs are facilities which would be used for recreation purposes.

F(46) $$\frac{\text{Parks Costs}}{(FPC_2)} = \frac{\text{Acquisition Cost}}{(FPC_{2A})} + \frac{\text{Development Cost}}{(FPC_{2B})}$$

$$\frac{\qquad\qquad}{(FPC_2)} = \frac{\qquad\qquad}{(FPC_{2A})} + \frac{\qquad\qquad}{(FPC_{2B})}$$

F(46A) $$\frac{\text{Acres Required}}{(FPU)} = \frac{\text{Total Population in City}}{(FTP_1)} \div 1000 \times \frac{\text{Standard Acres per Thousand}}{(IPP)}$$

$$\frac{\qquad\qquad}{(FPU)} = \frac{\qquad\qquad}{(FTP_1)} \div 1000 \times \frac{\qquad\qquad}{(IPP)}$$

F(46B) $$\frac{\text{Acquisition Cost}}{(FPC_{2A})} = \left(\frac{\text{Acres Required}}{(FPU)} - \frac{\text{Acres Available}}{(IPU_1)}\right) \times \frac{\text{Cost per Acre}}{(IPC_1)}$$

$$\frac{\qquad\qquad}{(FPC_{2A})} = \left(\frac{\qquad\qquad}{(FPU)} - \frac{\qquad\qquad}{(IPU_1)}\right) \times \frac{\qquad\qquad}{(IPC_1)}$$

Formula 46 (Continued)

$$\text{F(46C)}\quad \frac{\text{Development Cost}}{(\text{FPC}_{2B})} = \left(\frac{\text{Acres Required}}{(\text{FPU})} - \frac{\text{Acres Developed}}{(\text{IPU}_2)}\right) \times \frac{\text{Cost per Acre}}{(\text{IPC}_2)}$$

$$\frac{\qquad\qquad}{(\text{FPC}_{2B})} = \left(\frac{\qquad\qquad}{(\text{FPU})} - \frac{\qquad\qquad}{(\text{IPU}_2)}\right) \times \frac{\qquad\qquad}{(\text{IPC}_2)}$$

Source of Data:

FTP_1 - Formula 11A
IPU_{1-2} - Input data, Section 3
IPC_{1-2} - Input data, Section 3
IPP^{1-2} - Input data, Section 3

FORMULA #47

RETAIL SPACE

Retail costs are those involved in constructing restaurants, shopping centers, retail stores and service stations.

F(47)	Retail Space Costs (FCC_1)	=	New Retail Space (FCS)	x	Cost per Square Foot (ICC_1)
	______ (FCC_1)	=	______ (FCS)	x	______ (ICC_1)
F(47A)	New Retail Space (FCS)	=	New Retail Sales (FRS)	÷	Sales per Square Foot (ICU_1)
	______ (FCS)	=	______ (FRS)	÷	______ (ICU_1)

Sources of Data:

FRS - Formula 15

ICU_1 - Input data, Section 3

ICC_1 - Input data, Section 3

FORMULA #48
WHOLESALE SPACE

Wholesale space covers suppliers to the coal-utilization facility and retail businesses in the town. Space requirements and costs are estimated directly from wholesale purchases, calculated in Formula 17.

$$F(48)\quad \underset{(FWC_2)}{\underline{\text{Wholesale Space Cost}}} = \left(\underset{(FWS)}{\underline{\text{Total Wholesale Space}}} - \underset{(IWS)}{\underline{\text{Existing Wholesale Space}}} \right) \times \underset{(IWC_2)}{\overset{\text{Cost per}}{\underline{\text{Square Foot}}}}$$

$$\underset{(FWC_2)}{\underline{\hspace{4cm}}} = \left(\underset{(FWS)}{\underline{\hspace{4cm}}} - \underset{(IWS)}{\underline{\hspace{4cm}}} \right) \times \underset{(IWC_2)}{\underline{\hspace{2cm}}}$$

$$F(48A)\quad \underset{(FWS))}{\underline{\text{Total Wholesale Space}}} = \underset{(FWT)}{\underline{\text{Total Wholesale Sales}}} \div \underset{(IWU_1)}{\underline{\text{Sales per Square Foot}}}$$

$$\underset{(FWS)}{\underline{\hspace{4cm}}} \qquad \underset{(FWT)}{\underline{\hspace{4cm}}} \qquad \underset{(IWU_1)}{\underline{\hspace{4cm}}}$$

Sources of Data:

FWT - Formula 17
IWU_1 - Input data, Section 3
IWC_2 - Input data, Section 3
IWS - Input data, Section 3

FORMULA # 49
OFFICE SPACE

Office space covers financial, medical and other professional and personal service businesses to serve the population of the community. Costs are estimated based on added population in the community.

F(49)

$$\underset{(FCC_2)}{\underline{\text{Office Space Costs}}} = \underset{(FCU_1)}{\underline{\text{New Office Space}}} \times \underset{(ICC_2)}{\underline{\text{Cost per Square Foot}}}$$

$$\underset{(FCC_2)}{\underline{\qquad\qquad\qquad}} = \underset{(FCU_1)}{\underline{\qquad\qquad\qquad}} \times \underset{(ICC_2)}{\underline{\qquad\qquad\qquad}}$$

F(49A)

$$\underset{(FCU_1)}{\underline{\text{New Office Space}}} = \underset{(FPO_3)}{\underline{\text{Added Population in Community}}} \times \underset{(ICP)}{\underline{\text{Space per Capita}}}$$

$$\underset{(FCU_1)}{\underline{\qquad\qquad\qquad}} = \underset{(FPO_3)}{\underline{\qquad\qquad\qquad}} \times \underset{(ICP)}{\underline{\qquad\qquad\qquad}}$$

Source of Data:

FPO_3 - Formula 10
ICP - Input data, Section 3
ICC_2 - Input data, Section 3

FORMULA #50
HOTEL/MOTEL

Hotel/motel construction costs are estimated based on business related demand and population-related demand. Tourism demand could also be a factor but is not considered in this study.

F(50)

$$\underset{(FHC_6)}{\underline{\text{Hotel/Motel Costs}}} = \underset{(FHU)}{\underline{\text{Number of Rooms Required}}} \times \underset{(IHC_5)}{\underline{\text{Costs per Room}}}$$

$$\underset{(FHC_6)}{\underline{\hspace{4cm}}} = \underset{(FHU)}{\underline{\hspace{5cm}}} \times \underset{(IHC_5)}{\underline{\hspace{3cm}}}$$

F(50A)

$$\underset{(FHU)}{\underline{\text{Number of Rooms Required}}} = \left(\underset{(FTP)}{\underline{\text{Total Community Population}}} \times \underset{(IHP_1)}{\underline{\text{Rooms per Capita}}}\right) + \left(\underset{(FBE_1)}{\underline{\text{Total Base Employment}}} \times \underset{(IHP_2)}{\underline{\text{Rooms per Job}}}\right) - \underset{(IHU_3)}{\underline{\text{Existing Rooms}}}$$

$$\underset{(FHU)}{\underline{\hspace{3cm}}} = \left(\underset{(FTP)}{\underline{\hspace{3cm}}} \times \underset{(IHP_1)}{\underline{\hspace{2cm}}}\right) + \left(\underset{(FBE_1)}{\underline{\hspace{2cm}}} \times \underset{(IHP_2)}{\underline{\hspace{3cm}}}\right) - \underset{(IHU_3)}{\underline{\hspace{3cm}}}$$

Sources of data:

FTP	-	Formula 11
IHU_3	-	Input data, Section 3
IHC_5	-	Input data, Section 3
IHP_{1-2}	-	Input data, Section 3
FBE_1	-	Formula 1

FORMULA #51
COMMERCIAL RECREATION

Commercial recreation includes a variety of commercial activities for entertainment, including theaters, bowling alleys and golf courses. Costs are estimated on a per capita basis.

F(51) Commercial Recreation Costs (FEC) = Total New Population (FPO_3) x Cost per Capita (IEC)

______ (FEC) = ______ (FPO_3) x ______ (IEC)

Sources of Data:

FPO_3 - Formula 10
IEC - Input data, Section 3

FORMULA # 52
ADDED ASSESSED VALUATION

Property tax revenues available to the city and county are based on the assessed valuation in the city and community. Taxable property includes housing, utilities, and commercial facilities.

F (52A)
$$\underset{(FAV_1)}{\underline{\text{Assessed Valuation Single Family Housing}}} = \underset{(FHC_2)}{\underline{\text{Single Family Housing Cost}}} \times \underset{(IAV_1)}{\underline{\text{State Ratio of Assessed to Market Value}}}$$

$$\underset{(FAV_1)}{\underline{\hspace{5cm}}} = \underset{(FHC_2)}{\underline{\hspace{3cm}}} \times \underset{(IAV_1)}{\underline{\hspace{5cm}}}$$

F (52B)
$$\underset{(FAV_2)}{\underline{\text{Assessed Valuation Multi-Family Housing}}} = \underset{(FHC_3)}{\underline{\text{Multi-Family Housing Cost}}} \times \underset{(IAV_2)}{\underline{\text{State Ratio of Assessed to Market Value}}}$$

$$\underset{(FAV_2)}{\underline{\hspace{5cm}}} = \underset{(FHC_3)}{\underline{\hspace{3cm}}} \times \underset{(IAV_2)}{\underline{\hspace{5cm}}}$$

F (52C)
$$\underset{(FAV_3)}{\underline{\text{Assessed Valuation Mobile Homes}}} = \underset{(FHC_4)}{\underline{\text{Mobile Home Housing Cost}}} \times \underset{(IAV_3)}{\underline{\text{State Ratio of Assessed to Market Value}}}$$

$$\underset{(FAV_3)}{\underline{\hspace{5cm}}} = \underset{(FHC_4)}{\underline{\hspace{3cm}}} \times \underset{(IAV_3)}{\underline{\hspace{5cm}}}$$

FORMULA #52 (Continued)

F(52D)

$$\frac{\text{Assessed Valuation Utilties}}{(FAV_4)} = \frac{\text{Total Utility Cost}}{(FEG)} \times \frac{\text{State Ratio of Assessed to Market Value}}{(IAV_4)}$$

$$\frac{\qquad\qquad}{(FAV_4)} = \frac{\qquad\qquad}{(FEG)} \times \frac{\qquad\qquad}{(IAV_4)}$$

F (52E)

$$\frac{\text{Assessed Valuation Commercial}}{(FAV_5)} = \left(\frac{\text{Retail Space Costs}}{(FCC_1)} + \frac{\text{Wholesale Space Costs}}{(FWC_2)} + \frac{\text{Office Space Costs}}{(FCC_2)} + \frac{\text{Hotel/ Motel Cost}}{(FHC_6)} + \frac{\text{Commercial Recreation Cos}}{(FEC)}\right.$$

$$\times \frac{\text{State Ratio to Assessed to Market Value}}{(IAV_5)}$$

$$\frac{\qquad\qquad}{(FAV_5)} = \left(\frac{\qquad\qquad}{(FCC_1)} + \frac{\qquad\qquad}{(FWC_2)} + \frac{\qquad\qquad}{(FCC_2)} + \frac{\qquad\qquad}{(FHC_6)} + \frac{\qquad\qquad}{(FEC)}\right)$$

$$\times \frac{\qquad\qquad}{(IAV_5)}$$

F (52F)

$$\frac{\text{Assessed Valuation Coal Facilities}}{(FAV_6)} = \frac{\text{Projected Assessed Valuation (By Company)}}{(C_4)}$$

$$\frac{\qquad\qquad}{(FAV_6)} = \frac{\qquad\qquad}{(C_4)}$$

FORMULA #52 (Continued)

Sources of Data:

IAV_{1-5} - Input data, Section 3
FHC_2 - Formula 33
FHC_3 - Formula 34
FMC_4 - Formula 35
FEG - Formula 31
FCC_1 - Formula 47
FWC_2 - Formula 48
FCC_2 - Formula 49
FHC_6 - Formula 50
FEC - Formula 51
C_4 - Company input data, Chapter IV

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FORMULA #53
ADDED ASSESSED VALUATION BY JURISDICTION

The county and school district(s) will have added to their tax base the entire assessed valuation of the community. The assumption is made for city assessed valuation that housing and utilities will be related to share of added community housing units, that all added commercial will be in the city and that coal facilities will be outside the city.

$$\text{F(53)} \quad \frac{\text{Added Assessed Valuation in Community}}{(\text{FAV})} = \frac{\text{A. V. Single Family}}{(\text{FAV}_1)} + \frac{\text{A. V. Multi-Family}}{(\text{FAV}_2)} + \frac{\text{A. V. Mobile Homes}}{(\text{FAV}_3)} + \frac{\text{A. V. Utilities}}{(\text{FAV}_4)} + \frac{\text{A. V. Commercial}}{(\text{FAV}_5)} + \frac{\text{A. V. Coa Facilities}}{(\text{FAV}_6)}$$

$$\frac{\qquad\qquad}{(\text{FAV})} = \frac{\qquad}{(\text{FAV}_1)} + \frac{\qquad}{(\text{FAV}_2)} + \frac{\qquad}{(\text{FAV}_3)} + \frac{\qquad}{(\text{FAV}_4)} + \frac{\qquad}{(\text{FAV}_5)} + \frac{\qquad}{(\text{FAV}_6)}$$

$$\text{F(53A)} \quad \frac{\text{Added Assessed Valuation in City}}{(\text{FMAV})} = \left(\frac{\text{A. V. Single Family}}{(\text{FAV}_1)} + \frac{\text{A. V. Multi-Family}}{(\text{FAV}_2)} + \frac{\text{A. V. Mobile Homes}}{(\text{FAV}_3)} + \frac{\text{A. V. Utilities}}{(\text{FAV}_4)}\right) \times$$

$$\frac{\text{Total Population in City}}{\text{FTP}_1} \div \frac{\text{Total Population in Community}}{\text{FTP}} + \frac{\text{A. V. Commercial}}{\text{FAV}_5}$$

$$\frac{\qquad\qquad}{(\text{FMAV})} = \left(\frac{\qquad}{(\text{FAV}_1)} + \frac{\qquad}{(\text{FAV}_2)} + \frac{\qquad}{(\text{FAV}_3)} + \frac{\qquad}{(\text{FAV}_4)}\right) \times \frac{\qquad}{(\text{FTP}_1)} \div \frac{\qquad}{(\text{FTP})}$$

$$+ \frac{\qquad}{(\text{FAV}_5)}$$

Source of Data

FAV_{1-6} - Formula 52
FTP - Formula 11
FTP_1 - Formula 11 A

FORMULA #54
TOTAL ASSESSED VALUATION

Total assessed valuation for both the city, county and school district(s) during the steady state are calculated by adding existing assessed valuation to the projected added assessed valuation.

$$F(54)\quad \underset{\text{(FTAV)}}{\underline{\text{Total Assessed Valuation in Community}}} = \underset{(ICV_1)}{\underline{\text{Existing Assessed Valuation in Community}}} + \underset{\text{(FAV)}}{\underline{\text{Added Assessed Valuation in Community}}}$$

$$\underset{\text{(FTAV)}}{\underline{\hspace{4cm}}} = \underset{(ICV_1)}{\underline{\hspace{4cm}}} + \underset{\text{(FAV)}}{\underline{\hspace{4cm}}}$$

$$F(54A)\quad \underset{\text{(FTMV)}}{\underline{\text{Total Assessed Valuation in City}}} = \underset{(ICV_2)}{\underline{\text{Existing Assessed Valuation in City}}} + \underset{\text{(FMAV)}}{\underline{\text{Added Assessed Valuation in City}}}$$

$$\underset{\text{(FTMV)}}{\underline{\hspace{4cm}}} = \underset{(ICV_2)}{\underline{\hspace{4cm}}} + \underset{\text{(FMAV)}}{\underline{\hspace{4cm}}}$$

Source of Data

FAV - Formula 53
ICV_{1-2} - Input data, Section 3
FMAV - Formula 53A

VII. PUBLIC OPERATIONS

Public services for residents and businesses at the local level are provided by three major types of local jurisdictions:

- Counties
- Cities
- School Districts

No consideration is given to special districts which may be established by either counties or cities. Usually these are either rurally oriented, e.g., irrigation districts, not affected by population growth, or urban services, such as water and sewer districts which are assumed in this analysis to be provided by the city government.

In this section, projected expenditures and revenues for these levels are determined for a steady state period several years after opening of the coal-utilization facility.

1. PROJECTIONS WILL BE MADE FOR THE TOTAL COMMUNITY

In both the section on economic activity and that on capital requirements, it is possible to project the added impact or cost from new population and add that to the existing population or facilities. In this case, such a method is not considered appropriate. Local government operating costs will be largely determined by the size of the total community to be served, including both present and future residents. Furthermore, the level of service to both will be the same, i.e., present residents will receive the same level of service as new residents in the future.

The methodology of this section, therefore, is to create general, yet comprehensive budgets for the county(s), city(s) and school district(s) under study for one year sometime in the steady state period. These projections are not intended to be a forecast of what the budgets themselves might be in any particular year, but rather are intended to present the relative impacts of growth on local government finances so that cost/revenue analyses can be made. The actual budgets for any given year will be affected by:

- Actual population
- Level of service desired
- Policy decisions by legislative bodies
- Pertinent state laws
- Available financial resources

With all these factors at work, and with an initial assumption that for most local governments the population growth induced by coal utilization will significantly alter levels of service, it is not usually possible to project future governmental expenditures or revenues using current experience. A town which grows from 500 to 5,000 persons is not going to have precisely a tenfold increase. Rather than use straight line projections of current figures, this analysis will rely primarily on average per capita amounts for municipal and county governments of an equivalent size.

1. LOCAL GOVERNMENTS VARY FROM STATE TO STATE WITHIN THE REGION

Local governments are created and operated under state law and regulation. For that reason, the organizational structure, responsibilities and activities may vary from state to state within the Region. Revenues vary not only by the state's permitted taxing powers, but also by the type and amount of state financial assistance.

This analysis uses the same formulae for determining local government expenditures and revenues, but assumes different factors for each of the five states within the Region.

2. COUNTY GOVERNMENTS ACT AS AGENTS OF THE STATE IN PROVIDING SERVICES TO ALL RESIDENTS

The entire area of the five states is covered by county government, except the Yellowstone National Park portion of Montana. County governments normally provide:

- Land Use Controls
- Highways

- Public Welfare
- Hospitals and Public Health
- Police Protection
- Courts
- Collections

Additional services may be provided, but these are often done through the use of special districts with separate taxing authority.

The number of counties, method of governance and classification for each of the states is as follows:

Montana	56	County Board of Commissioners
Nebraska	93	Board of Commissioners except in counties having organized township government, where it is called the Board of Supervisors
North Dakota	53	County Board of Commissioners
South Dakota	64*	Board of Commissioners
Wyoming	23	County Board of Commissioners

Counties are divided into three classes according to assessed valuation as follows:

First class--$20 million or more
Second class--$10 million to $20 million
Third class--less than $10 million

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*Three counties lack organized government and are attached to other counties for administration.

Nebraska, North Dakota and South Dakota also have township governments covering portions of counties, largely responsible for road construction and maintenance.

3. CITIES ARE FORMED IN URBANIZED AREAS TO PROVIDE A HIGHER LEVEL OF PUBLIC CONTROL AND SERVICE

Each of the five states has procedures by which urbanized or urbanizing areas can incorporate to have a stronger voice over policy and land use decisions than county government permits; to provide new services counties do not usually provide, e.g., fire protection, water, sewage disposal, refuse collection, parks and recreation, library; and to provide a higher level of service than the county in streets and police protection. Generally even in incorporated municipalities, the county is responsible for public welfare, hospitals and health, and courts and corrections.

Municipal governments are governed by locally elected legislative bodies, generally called city councils. Each of the five states classifies its cities by title and population as follows:

- Municipal governments in Montana are the cities and towns. They are divided into the following classes according to population size:
    - First class--10,000 inhabitants or more
    - Second class--5,000 to 10,000 inhabitants
    - Third class--1,000 to 5,000 inhabitants
    - Towns--300 to 1,000 inhabitants

- Municipalities in Nebraska are the cities and villages. Cities are divided into the following four classes according to population size:

  - Metropolitan--300,000 inhabitants or more (Omaha)
  - Primary--100,000 to 300,000 inhabitants (Lincoln)
  - First class--5,000 to 100,000 inhabitants
  - Second class--1,000 to 5,000 inhabitants

  Villages are municipalities with 100 to 1,000 inhabitants. Second class cities may elect to return to the village class. The minumum population required for incorporation is 100.

- Municipal governments in North Dakota are the cities, villages, and one town (Forman) which was created by special act. The minimum population requirement for incorporation as a city is 200; as a village, 100.

- Municipal governments in South Dakota are the cities and towns. Under general law cities fall into two classes according to population size:

  - First class--5,000 inhabitants or more
  - Second class--500 to 5,000 inhabitants

  Towns are municipalities with less than 500 inhabitants.

- Municipal governments in Wyoming are the cities (incorporations with over 4,000 inhabitants) and towns (incorporations with 150 to 4,000 inhabitants).

4. SCHOOL DISTRICTS ARE INDEPENDENT AGENCIES PROVIDING ELEMENTARY AND/OR HIGH SCHOOLS

The system of school districts in the five states is much more complex than that for counties and cities. All of the area of each state is covered by one or more districts providing elementary, high school or both. In addition, high school districts may provide junior college courses or independent districts may be established (junior college costs are not considered in this analysis). Typically, if the district is not unified, two or more elementary districts will be included within the territory of a high school district. Finally, districts may be classified according to size as well as grades served.

Classification systems for each state are described as follows:

- Montana statutes provide for the creation of the following school districts which are treated in Census statistics as independent units of government:

  - First class--8,000 inhabitants or more
  - Second class--1,000 to 8,000 inhabitants
  - Third class--less than 1,000 inhabitants
  - County high school districts

  In addition, joint districts (intercounty) and consolidated districts may be established.

- Nebraska statutes provide for the creation of six classes of school districts and for junior college districts, all of which are included in the Census count of units of government. School districts are classified on the basis of school facilities offered--Class I districts providing only elementary schools and Class VI districts only high schools--and by population. The school districts offering both elementary and secondary education are classified by population size as follows: Class II--less than 1,000, Class III--1,000 to 50,000, Class IV--50,000 to 200,000, and Class V--over 200,000. All of these districts are governed by elected boards which are empowered to levy local school taxes and borrow money.

- A 1961 law provides that all school districts in North Dakota be designated as "public school districts" except the Fargo School District, which was established by special act. Each school district is governed by an elected school board empowered to levy local school taxes and issue bonds.

- South Dakota laws provide for the following types of school districts, all classified as independent units of government for Census statistics:

  - Independent district--operating a 12-year program or an accredited high school
  - Common district--operating less than a 12-year program and not operating an accredited high school
  - County independent district--only district in county and operating a 12-year program
  - County common district-- only district in county and operating less than a 12-year program
  - County high school district--operating a high school and overlying all common school districts in county
  - Superimposed high school district--operating a high school and overlying 2 or more common school districts

  The independent, common, and superimposed high school districts are governed by locally elected school boards. Each county independent, county common, or county high school district is governed by an elected county board of education. All school district boards in South Dakota are empowered to levy local school taxes and incur indebtedness.

- Public education in Wyoming is provided through the following types of school districts, all of which are included in the Census count of independent units of governments: First class school districts (districts, except high school districts, having a school population of 1,400 or more); high school districts; and all other school districts. Provision is also made for community college districts. Each of these types is governed by an elected board of trustees which is empowered to levy local school taxes and incur bonded indebtedness.

FORMULA # 55
MUNICIPAL POLICE EXPENDITURE

Includes police patrol, traffic enforcement, criminal investigation, including vehicles and equipment.

Police protection costs are highly related to total population of the community. National studies indicate per capita costs rise significantly only above 100,000.

$$F(55)\quad \frac{\text{Police Protection Costs}}{(\text{FMPE})} = \frac{\text{Total Municipal Population}}{(\text{FTP}_1)} \times \frac{\text{Cost Per Capita}}{(\text{IPE}_1)}$$

$$\frac{\qquad\qquad}{(\text{FMPE})} = \frac{\qquad\qquad}{(\text{FTP}_1)} \times \frac{\qquad\qquad}{(\text{IPE}_1)}$$

Source of data

FTP_1 = Formula 11A
IPE_1 = Input data, Section 4

FORMULA #56

MUNICIPAL FIRE PROTECTION EXPENDITURE

Includes fire prevention and suppression, including all vehicles and equipment. Building costs are in Capital Outlay.

Fire protection costs tend to increase on a per capita basis as city size grows. Different per capita factors are provided for separate population categories.

$$F(56)\quad \underset{(\text{FMFE})}{\underline{\text{Fire Protection Costs}}} = \underset{(\text{FTP}_1)}{\underline{\text{Total Municipal Population}}} \times \underset{(\text{IFE})}{\underline{\text{Cost Per Capita}}}$$

$$\underset{(\text{FMFE})}{\underline{\hspace{4cm}}} = \underset{(\text{FTP}_1)}{\underline{\hspace{5cm}}} \times \underset{(\text{IFE})}{\underline{\hspace{3cm}}}$$

Source of data

FTP_1 = Formula 11A
IFE = Input data, Section 4

FORMULA #57

MUNICIPAL WATER EXPENDITURE

Includes water supply, purchase of water, pumping costs, and distribution to residences and businesses.

Water supply costs are directly related to the number of gallons delivered, which is calculated in Capital Outlay.

$$\text{F(57)}\quad \frac{\text{Water Costs}}{(\text{FMWE})} = \frac{\begin{array}{c}\text{Standard Operating Rate for}\\ \text{Type of Water Supply Facility}\\ \text{Cost per Thousand Gallons}\end{array}}{(\text{IWE}_1)} \times \frac{\begin{array}{c}\text{Average Water Use}\\ \text{Per Capita}\\ \text{(000 of Gallons)}\end{array}}{(\text{IWP})} \times \frac{\begin{array}{c}\text{Total Population}\\ \text{in City}\end{array}}{(\text{FTP}_1)}$$

$$\underset{(\text{FMWE})}{\underline{\hspace{3cm}}} = \underset{(\text{IWE}_1)}{\underline{\hspace{6cm}}} \times \underset{(\text{IWP})}{\underline{\hspace{4cm}}} \times \underset{(\text{FTP}_1)}{\underline{\hspace{3cm}}}$$

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FORMULA #57 (Continued)

Alternate method:

$$\text{F(57A)} \quad \frac{\text{Water Costs}}{\text{(FMWE)}} = \frac{\text{Water Cost per Household}}{(\text{IWE}_2)} \times \frac{\text{Total Households in City}}{(\text{FPO}_{2A})}$$

$$\frac{\qquad\qquad}{\text{(FMWE)}} = \frac{\qquad\qquad\qquad}{(\text{IWE}_2)} \times \frac{\qquad\qquad\qquad}{(\text{FPO}_{2A})}$$

Source of Data

$\text{IWE}_1\text{-2}$ - Input data Section 4

FTP_1 - Formula 11A

FPO_{2A} - Formula 9A

FORMULA #58
MUNICIPAL SEWAGE DISPOSAL EXPENDITURE

Covers collection of sewage, transmission to treatment plant, and full treatment to meet current standards. Capital costs are included in Capital Outlay.

$$F(58)\quad \frac{\text{Sewage Disposal Costs}}{(\mathrm{FMDE})} = \frac{\begin{array}{c}\text{Standard Operating Rates for}\\ \text{Type of Sewage Facilities}\\ \text{Cost per Thousand Gallons}\end{array}}{(\mathrm{IDE}_1)} \times \frac{\begin{array}{c}\text{Average Sewage}\\ \text{Per Capita}\\ \text{(000 Gallons)}\end{array}}{(\mathrm{IDP})} \times \frac{\begin{array}{c}\text{Total Population}\\ \text{in City}\end{array}}{(\mathrm{FTP}_1)}$$

$$\frac{\phantom{\text{Sewage Disposal Costs}}}{(\mathrm{FMDE})} = \frac{\phantom{\text{Cost per Thousand Gallons}}}{(\mathrm{IDE}_1)} \times \frac{\phantom{\text{(000 Gallons)}}}{(\mathrm{IDP})} \times \frac{\phantom{\text{Total Population}}}{(\mathrm{FTP}_1)}$$

FORMULA #58 (Continued)

Alternate method:

$$F\ (58A)\ \underset{(FMDE)}{\underline{\text{Sewage Disposal Costs}}} = \underset{(IDE_2)}{\underline{\text{Cost per Household}}} \times \underset{(FPO_{2A})}{\underline{\text{Total Households in City}}}$$

$$\underset{(FMDE)}{\underline{\qquad\qquad\qquad\qquad}} = \underset{(IDE_2)}{\underline{\qquad\qquad\qquad}} \times \underset{(FPO_{2A})}{\underline{\qquad\qquad\qquad\qquad}}$$

Source of data

IDE_{1-2} = Input data, Section 4
IDP = Input data, Section 4
FTP_1 = Formula 11A
FPO_{2A} = Formula 9A

FORMULA #59
MUNICIPAL SANITATION EXPENDITURE

Includes collection and disposal of refuse. Land fill costs are included in Capital Outlay. These costs are included under municipal government, although many areas may use a private contractor.

Refuse collection costs tend to decline on a per-household basis as the population increases.

$$F(59)\quad \frac{\text{Sanitation Costs}}{(\text{FMGE})} = \frac{\text{Total Municipal Population}}{(\text{FTP}_1)} \times \frac{\text{Cost Per Capita}}{(\text{IGE})}$$

$$\frac{\rule{3cm}{0.4pt}}{(\text{FMGE})} = \frac{\rule{4cm}{0.4pt}}{(\text{FTP}_1)} \times \frac{\rule{3cm}{0.4pt}}{(\text{IGE})}$$

Source of data

FTP_1 = Formula 11 A
IGE = Input data, Section 4

FORMULA #60

MUNICIPAL STREET MAINTENANCE EXPENDITURE

Covers maintenance of streets, curbs and gutters, traffic painting, and street cleaning. Construction is included in Capital Outlay.

Street maintenance costs tend to increase as city size and thus traffic increase, but decline as the quality of street construction improves.

$$\text{F(60)}\quad \frac{\text{Street Maintenance Cost}}{(\text{FMSE})} = \frac{\text{Arterial Street Cost}}{(\text{FSE}_1)} + \frac{\text{Local Street Cost}}{(\text{FSE}_2)}$$

$$\frac{\underline{\hspace{4cm}}}{(\text{FMSE})} = \frac{\underline{\hspace{4cm}}}{(\text{FSE}_1)} + \frac{\underline{\hspace{3cm}}}{(\text{FSE}_2)}$$

$$\text{F(60A)}\quad \frac{\text{Arterial Street Cost}}{(\text{FSE}_1)} = \frac{\text{Miles of Arterial Street}}{(\text{ISS}_1)} \times \frac{\text{Maintenance Cost per Mile for Arterial Streets}}{(\text{ISE}_1)}$$

$$\frac{\underline{\hspace{4cm}}}{(\text{FSE}_1)} = \frac{\underline{\hspace{4cm}}}{(\text{ISS}_1)} \times \frac{\underline{\hspace{4cm}}}{(\text{ISE}_1)}$$

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June 18, 1974

Mr. Alan B. Minier
Project Coordinator
Old West Regional Commission
Suite 404
2000 "L" Street, N.W.
Washington, D.C. 20036

Dear Mr. Minier:

We are pleased to submit this Procedures Manual for assessing the socioeconomic impact of the construction and operation of coal utilization facilities in the Old West Region.

The purpose of this manual is to provide a common methodology for studies of particular impact areas in the Region. Using a common methodology impact studies should provide comparable data and projections which could then be used to evaluate alternative public policies.

The Booz, Allen & Hamilton team has benefited from and appreciates greatly the excellent cooperation and support of the Commission staff and the officials of Montana, Nebraska, North Dakota, South Dakota, and Wyoming contacted during the study.

Very truly yours,

Booz, Allen & Hamilton Inc

FORMULA #60 (Continued)

$$F(60B) \quad \frac{\text{Local Street Cost}}{(FSE_2)} = \frac{\text{Miles of Local Street}}{(ISS_2)} \times \frac{\text{Maintenance Cost per Mile for Local Streets}}{(ISE_2)}$$

$$\frac{\qquad\qquad\qquad}{(FSE_2)} = \frac{\qquad\qquad\qquad}{(ISS_2)} \times \frac{\qquad\qquad\qquad}{(ISE_2)}$$

Another important determinant of street maintenance costs is the availability of funds, which is related to population. Costs per capita are therefore an appropriate measure.

$$F\ (60C) \quad \frac{\text{Street Maintenance Cost}}{(FSE)} = \frac{\text{Total Population}}{(FTP_1)} \times \frac{\text{Cost per Capita}}{(ISE_3)}$$

$$\frac{\qquad\qquad\qquad}{(FSE)} = \frac{\qquad\qquad\qquad}{(FTP_1)} \times \frac{\qquad\qquad\qquad}{(ISE_3)}$$

Source of Data

FTP_1 - Formula 11A
ISE_{1-3} - Input data, Section 4
ISS_{1-2} - Input data, Section 4

FORMULA #61

MUNICIPAL PARK MAINTENANCE EXPENDITURE

Covers maintenance of park areas, both existing and added under Capital Outlay.

Maintenance costs are directly related to number of acres.

$$F(61)\quad \frac{\text{Park Maintenance Cost}}{(FMRE_1)} = \frac{\text{Total Acres}}{(FPU)} \times \frac{\text{Cost per Acre}}{(IRE_1)}$$

$$\frac{\qquad\qquad}{(FMRE_1)} = \frac{\qquad\qquad}{(FPU)} \times \frac{\qquad\qquad}{(IRE_1)}$$

Source of data

FPU = Formula 46
IRE_1 = Input data, Section 4

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FORMULA #62
MUNICIPAL RECREATION EXPENDITURE

Covers public recreation programs run by the municipality.

Costs appear to be directly related to population, so a constant per-capita factor is applied.

$$\text{F(62)} \quad \frac{\text{Recreation Costs}}{(FMRE_2)} = \frac{\text{Total Municipal Population}}{(FTP_1)} \times \frac{\text{Cost per Capita}}{(IRE_2)}$$

$$\frac{\qquad\qquad}{(FMRE_2)} = \frac{\qquad\qquad}{(FTP_1)} \times \frac{\qquad\qquad}{(IRE_2)}$$

Source of data

FTP_1 = Formula 11A
IRE_2 = Input data, Section 4

FORMULA #63
MUNICIPAL LIBRARY EXPENDITURE

Covers the operation and maintenance of public library, including continuing program of book purchases.

Costs are directly related to population, so a standard per-capita factor is used.

$$\text{F(63)} \quad \frac{\text{Library Cost}}{\text{(FMLE)}} = \frac{\text{Total Population}}{(\text{FTP}_1)} \times \frac{\text{Cost per Capita}}{\text{(ILE)}}$$

$$\frac{\qquad\qquad\qquad}{\text{(FMLE)}} = \frac{\qquad\qquad\qquad}{(\text{FTP}_1)} \times \frac{\qquad\qquad\qquad}{\text{(ILE)}}$$

Source of data

FTP_1 = Formula 11A
ILE = Input data, Section 4

FORMULA #64

GENERAL MUNICIPAL GOVERNMENT EXPENDITURE

Covers the cost of legislative body, administration, finance and support, planning, engineering, building inspection, and miscellaneous expenditures not included above, such as insurance.

Per capita expenditures increase slightly as the size of the city increases. Costs of development services, e.g., planning and building inspection, are likely to be higher in growing communities; therefore, the high end of the range should be used.

$$F(64)\quad \underset{(\text{FMME})}{\underline{\text{General Government}}} = \underset{(\text{FTP}_1)}{\underline{\text{Total Population}}} \times \underset{(\text{IME}_1)}{\underline{\text{Cost per Capita}}}$$

$$\underset{(\text{FMME})}{\underline{\hspace{4cm}}} = \underset{(\text{FTP}_1)}{\underline{\hspace{4cm}}} \times \underset{(\text{IME}_1)}{\underline{\hspace{4cm}}}$$

Source of data

FTP_1 = Formula 11A
IME_1 = Input data, Section 4

FORMULA #65
TOTAL MUNICIPAL EXPENDITURES

	Category		Amounts	Source
	Police Protection	(FMPE)		F(55)
	Fire Protection	(FMFE)		F(56)
	Water	(FMWE)		F(57)
	Sewage Disposal	(FMDE)		F(58)
	Sanitation	(FMGE)		F(59)
	Street Maintenance	(FMSE)		F(60)
	Park Maintenance	(FMRE$_1$)		F(61)
	Recreation	(FMRE$_2$)		F(62)
	Library	(FMLE)		F(63)
	General Government	(FMME)		F(64)
F(65)	TOTAL		(FMTE)	

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FORMULA #65 (Continued)

Alternate method:

As a check on the reasonableness of the total above F (65) total municipal expenditures may be calculated based on statewide averages.

$$F(65A)\quad \frac{\text{Total Municipal Expenditures}}{\text{(FTME)}} = \frac{\text{Total Population}}{(FTP_1)} \times \frac{\text{Cost per Capita}}{(IME_2)}$$

$$\frac{\rule{4cm}{0.4pt}}{\text{(FTME)}} = \frac{\rule{2cm}{0.4pt}}{(FTP_1)} \times \frac{\rule{2cm}{0.4pt}}{(IME_2)}$$

Source of data

FTP_1 = Formula 11 A
IME_2 = Input data, Section 4

FORMULA #66

COUNTY HIGHWAY MAINTENANCE EXPENDITURE

Covers costs of repairing and maintaining county roads generally assumed to be two-lane except as noted in capital outlay.

Road expenditures costs are directly related to the miles of road.

$$F(66)\quad \underset{(FCSE)}{\underline{\text{Highway Costs}}} = \underset{(FTP)}{\underline{\text{Total Population}}} \times \underset{(ISE_4)}{\underline{\text{Expenditure per Capita}}}$$

$$\underset{(FCSE)}{\underline{\hspace{3cm}}} = \underset{(FTP)}{\underline{\hspace{3cm}}} \times \underset{(ISE_4)}{\underline{\hspace{4cm}}}$$

Source of Data

FTP - Formula 11

ISE_4 - Input data, Section 5

FORMULA #67

COUNTY PUBLIC WELFARE EXPENDITURE

Public welfare costs for the entire county, including within cities are assumed to be a county responsibility.

The complexities of the welfare system and the difficulty of estimating precise needs argue for using a state-wide average per capita for estimating purposes.

$$F(67)\quad \frac{\text{Public Welfare}}{(\text{FCWE})} = \frac{\text{Total Population}}{(\text{FTP})} \times \frac{\text{Expenditure per Capita}}{(\text{IWE}_3)}$$

$$\frac{\qquad\qquad}{(\text{FCWE})} = \frac{\qquad\qquad}{(\text{FTP})} \times \frac{\qquad\qquad}{(\text{IWE}_3)}$$

Source of Data

FTP - Formula 11
IWE_3 - Input data, Section 5

FORMULA #68

COUNTY HOSPITAL AND PUBLIC HEALTH EXPENDITURE

Counties have responsibility for providing public health services, and hospital services for the indigent. In addition, hospital services may be provided to the entire county. Specialized hospitals are likely to be provided in major centers outside the county. Hospital and public health costs are directly related to the total population.

$$F(68)\quad \underset{\text{(FCHE)}}{\underline{\text{Hospital and Health}}} = \underset{\text{(FTP)}}{\underline{\text{Total Population}}} \times \underset{\text{(IHE)}}{\underline{\text{Cost per Capita}}}$$

$$\underset{\text{(FCHE)}}{\underline{\qquad\qquad\qquad}} = \underset{\text{(FTP)}}{\underline{\qquad\qquad\qquad}} \times \underset{\text{(IHE)}}{\underline{\qquad\qquad\qquad}}$$

Source of Data

FTP - Formula 11
IHE - Input data, Section 5

FORMULA # 69

COUNTY POLICE AND CRIMINAL JUSTICE EXPENDITURE

Counties have responsibility for providing police services for areas of the county outside cities. The level of service is typically lower than for within cities, concentrating on investigation rather than patrol or traffic.

Costs are directly related to the population located outside cities.

$$\text{F (69)} \quad \frac{\text{Police Protection}}{\text{(FCPE)}} = \frac{\text{Population Outside Cities}}{\text{(FTP}_2\text{)}} \times \frac{\text{Cost per Capita}}{\text{(IPE}_2\text{)}}$$

$$\frac{\rule{3cm}{0pt}}{\text{(FCPE)}} = \frac{\rule{4cm}{0pt}}{\text{(FTP}_2\text{)}} \times \frac{\rule{2.5cm}{0pt}}{\text{(IPE}_2\text{)}}$$

FORMULA # 69 (Continued)

County governments are responsible for providing courts and correction facilities for the entire county, both within and outside cities. Costs are related to the total population of the county.

$$F\ (69A)\qquad \underset{(FCJE)}{\underline{\text{Criminal Justice Cost}}} = \underset{(FTP)}{\underline{\text{Total Population}}} \times \underset{(IJE)}{\underline{\text{Cost per Capita}}}$$

$$\underset{(FCJE)}{\underline{\qquad\qquad\qquad}} = \underset{(FTP)}{\underline{\qquad\qquad\qquad}} \times \underset{(IJE)}{\underline{\qquad\qquad\qquad}}$$

Source of Data

FTP - Formula 11
FTP_2 - Formula 11B
IPE_2 - Input data, Section 5
IJE - Input data, Section 5

FORMULA #70

GENERAL COUNTY EXPENDITURE

Covers legislative and administrative costs, finance and support, land use controls, engineering and building inspection and all other costs not covered in Formulae

Costs are related to total population of the county, and tend to decline on a per-capita basis as population increases.

$$F(70)\quad \frac{\text{General County Costs}}{\text{(FCGE)}} = \frac{\text{Total Population}}{\text{(FTP)}} \times \frac{\text{Cost per Capita}}{(\text{ICE}_1)}$$

$$\frac{\qquad\qquad}{\text{(FCGE)}} = \frac{\qquad\qquad}{\text{(FTP)}} \times \frac{\qquad\qquad}{(\text{ICE}_1)}$$

Source of Data

FTP - Formula 11
ICE_1 - Input data, Section 5

FORMULA #71
TOTAL COUNTY EXPENDITURES

Expenditure		Amount	Source
Highway	(FCSE)		F(66)
Public Welfare	(FCWE)		F(67)
Hospitals and Public Health	(FCHE)		F(68)
Police Protection	(FCPE)		F(69)
Criminal Justice	(FCJE)		F (69A)
General Government	(FCGE)		F(70)
F (71) TOTAL		(FCTE)	

Alternative Method:

As a check on the reasonableness of the total above F (71), total county expenditures may be calculated based on state-wide averages:

F(71A) $\frac{\text{Total County Expenditures}}{(FCTE)} = \frac{\text{Total Population}}{(FTP)} \times \frac{\text{Cost per Capita}}{(ICE_2)}$

$\frac{\underline{\hspace{4cm}}}{((FCTE)} = \frac{\underline{\hspace{3cm}}}{(FTP)} \times \frac{\underline{\hspace{3cm}}}{(ICE_2)}$

Source of Data

FTP - Formula 11
ICE_2 - Input data, Section 5

FORMULA # 72
ELEMENTARY SCHOOL EXPENDITURE

Covers the cost of operating and maintaining elementary schools (K-6, i.e., kindergarten through sixth grade). Cost is directly related to number of students, but declined on a per-student basis as the size of the district increases.

F (72) Elementary School Expenditures (FSE_{1A}) = Total Elementary Students (FSP_2) x Cost per Elementary Student (ISE_5)

$\underline{\qquad\qquad\qquad}$ (FSE_{1A}) = $\underline{\qquad\qquad\qquad}$ (FSP_2) x $\underline{\qquad\qquad\qquad}$ (ISE_5)

F (72A) Total Elementary Students (FSP_2) = New Students in Elementary School (FSP_{1A}) + Current Students in Elementary School (ISP_3)

$\underline{\qquad\qquad\qquad}$ (FSP_2) = $\underline{\qquad\qquad\qquad}$ (FSP_{1A}) + $\underline{\qquad\qquad\qquad}$ (ISP_3)

Source of Data

FSP_{1A} - Formula 12A
ISP_3 - Input data, Section 3
ISE_5 - Input data, Section 6

Note: In case of unified school districts, the formulae for elementary schools may be used for unified--the high school formulae will not be needed.

FORMULA # 73
HIGH SCHOOL EXPENDITURE

Covers the cost of operating and maintaining high schools (grades 7-12). Cost is directly related to number of students, but declines on a per-student basis as the size of the district increases.

F (73)	High School Expenses (FSE_{1B})	=	Total High School Students (FSP_3)	x	Cost per High School Student (ISE_6)
	______________ (FSE_{1B})	=	______________ (FSP_3)	x	______________ (ISE_6)
F (73A)	Total High School Students (FSP_3)	=	New Students in High School (FSP_{1B})	+	Current Students in High School (ISP_5)
	______________ (FSP_3)	=	______________ (FSP_{1B})	+	______________ (ISP_5)

Source of Data

FSP_{1B} - Formula 12B
ISP_5 - Input data, Section 3
ISE_6 - Input data, Section 6

FORMULA # 74
STATE PER-PUPIL ALLOCATION

The state may allocate to school districts one or more annual allocation based on the number of pupils enrolled, or upon the average daily attendance. This allocation is not based on need. Allocation should be separately calculated for elementary and high school districts. The allocation could be paid from funds collected on natural resource extraction.

F (74A)	State Elementary per Pupil Allocation ($FSAR_{1A}$)	=	Total Elementary Students (FSP_2)	x	State Allocation Rate (ISR_{1A})
	________ ($FSAR_{1A}$)	=	________ (FSP_2)	x	________ (ISR_{1A})
F (74B)	State High School per Pupil Allocation ($FSAR_{1B}$)	=	. Total High School Students (FSP_3)	x	State Allocation Rate (ISR_{1B})
	________ ($FSAR_{1B}$)	=	________ (FSP_3)	x	________ (ISR_{1B})

Source of Data

FSP_2 - Formula 72A
ISR_{1A} - Input data, Section 6
FSP_3 - Formula 73A
ISR_{1B} - Input data, Section 6

FORMULA #75
STATE EQUALIZATION--ELEMENTARY SCHOOL

The state may give aid to school districts which have an assessed valuation per pupil lower than a level which the state determines is required for basic school support. The three following formulae are required to calculate the state equalization support.

$$F(75A)\quad \frac{\text{Actual Level of Assessed Valuation}}{(FSER_{3A})} = \frac{\text{Total Community Assessed Valuation}}{(FTAV)} \div \frac{\text{Elementary Students}}{(FSP_{2})}$$

$$\frac{\rule{4cm}{0.4pt}}{(FSER_{3A})} = \frac{\rule{4cm}{0.4pt}}{(FTAV)} \div \frac{\rule{4cm}{0.4pt}}{(FSP_{2})}$$

$$F(75B)\quad \frac{\text{Deficiency of Assessed Valuation}}{(FSER_{2A})} = \frac{\text{Base Level of Assessed Valuation (Elem.)}}{(ISR_{2A})} - \frac{\text{Actual Level of Assessed Valuation}}{(FSER_{3A})}$$

$$\frac{\rule{4cm}{0.4pt}}{(FSER_{2A})} = \frac{\rule{4cm}{0.4pt}}{(ISR_{2A})} - \frac{\rule{4cm}{0.4pt}}{(FSER_{3A})}$$

FORMULA # 75 (Continued)

$$F\ (75C)\ \frac{\text{State Equalization (Elem)}}{(FSER_{1A})} = \frac{\text{Deficiency of Assessed Valuation}}{(FSER_{2A})} \times \frac{\text{State Support Factor (Elem.)}}{(ISR_{3A})}$$

$$\frac{\qquad\qquad}{(FSER_{1A})} = \frac{\qquad\qquad}{(FSER_{2A})} \times \frac{\qquad\qquad}{(ISR_{3A})}$$

Source of Data

FSP_2 - Formula 72A
FTAV - Formula 54
ISR_{2A} - Input data, Section 6
ISR_{3A} - Input data, Section 6

Note: If there is no deficiency of assessed valuation, i.e., if actual level exceeds base level, there will be no state equalization support.

FORMULA #75
STATE EQUALIZATION--HIGH SCHOOL

The state may give aid to school districts which have an assessed valuation per pupil lower than a level which the state determines is required for basic school support. The three following formulae are required to calculate the state equalization support.

F(75D) Actual Level of Assessed Valuation (FSER$_{3B}$) = Total Assessed Valuation of District (FTAV) - Total High School Students (FSP$_3$)

__________ (FSER$_{3B}$) = __________ (FTAV) - __________ (FSP$_3$)

F(75E) Defieiency of Assessed Valuation (FSER$_{2B}$) = Base Level of Assessed Valuation (H. S.) (ISR $_{2B}$) - Actual Level of Assessed Valuation (FSER$_{3B}$)

__________ (FSER$_{2B}$) = __________ (ISR$_{2B}$) - __________ (FSER$_{3B}$)

FORMULA # 75 (Continued)

$$F(75F)\quad \frac{\text{State Equalization (HS.)}}{(FSER_{1B})} \quad \frac{\text{Deficiency of Assessed Valuation}}{(FSER_{2B})} \times \frac{\text{State Support Factor (H. S.)}}{(ISR_{3B})}$$

$$\frac{\qquad\qquad}{(FSER_{1B})} = \frac{\qquad\qquad}{(FSER_{2B})} \times \frac{\qquad\qquad}{(ISR_{3B})}$$

Source of Data

FSP_3 - Formula 73A
FTAV - Formula 54
ISR_{2B}- Input data, Section 6
ISR_{3B} - Input data, Section 6

Note: If there is no deficiency of assessed valuation, i.e., if actual level exceeds base level, there will be no state equalization support.

FORMULA #76
OTHER STATE AID

In addition to state per-pupil allocations and equalization support, the state may give assistance in specific areas, such as for transportation, driver education, lunch programs, and vocational education. For purposes of this analysis, a per-pupil average may be used.

$$F(76A)\quad \frac{\text{Other State Aid to Elementary}}{(FSOR_{1A})} = \frac{\text{Total Elementary Students}}{(FSP_2)} \times \frac{\text{Average per Pupil Aid}}{(ISR_{4A})}$$

$$\frac{\qquad\qquad}{(FSOR_{1A})} = \frac{\qquad\qquad}{(FSP_2)} \times \frac{\qquad\qquad}{(ISR_{4A})}$$

$$F(76B)\quad \frac{\text{Other State Aid to High School}}{(FSOR_{1B})} = \frac{\text{Total High School Students}}{(FSP_3)} \times \frac{\text{Average per Pupil Aid}}{(ISR_{4B})}$$

$$\frac{\qquad\qquad}{(FSOR_{1B})} = \frac{\qquad\qquad}{(FSP_3)} \times \frac{\qquad\qquad}{(ISR_{4B})}$$

Source of Data

FSP_2-Formula 72A
FSP_3-Formula 73A
IRS_{4A}- Input data, Section 6
IRS_{4B}- Input data, Section 6

FORMULA #77
FEDERAL AID TO SCHOOLS

Federal aid to schools may be provided to both elementary and high school districts. This aid would be for a wide variety of uses, each with its own allocation schedule. For purposes of this analysis state wide averages on a per-pupil basis will be used.

$$F(77A)\quad \frac{\text{Elementary School Federal Aid}}{(FSFR_{1A})} \qquad \frac{\text{Total Elementary Students}}{(FSP_2)} \qquad \frac{\text{Per Pupil Federal Allocation Rate}}{(ISR_{5A})}$$

$$\frac{\qquad\qquad}{(FSFR_{1A})} \qquad \frac{\qquad\qquad}{(FSP_2)} \qquad \frac{\qquad\qquad}{(ISR_{5A})}$$

$$F(77B)\quad \frac{\text{High School Federal Aid}}{(FSFR_{1B})} = \frac{\text{Total High School Students}}{(FSP_3)} \times \frac{\text{Per Pupil Federal Allocation Rate}}{(ISR_{5B})}$$

$$\frac{\qquad\qquad}{(FSFR_{1B})} = \frac{\qquad\qquad}{(FSP_3)} \times \frac{\qquad\qquad}{(ISR_{5B})}$$

Source of Data

FSP_2 - Formula 72A
FSP_3 - Formula 72B
ISR_{5A} - Input data, Section 6
ISR_{5B} - Input data, Section 6

FORMULA #78
PROPERTY TAXES

Each school district is supported to a large extent by local property taxes. In this formula, the extent to which the existing operating tax rate will raise funds is determined.

$$F(78A)\quad \frac{\text{Property Taxes for Elementary}}{(FSPR_{1A})} = \frac{\text{Assessed Valuation in Community}}{(FTAV)} \times \frac{\text{Elementary Total Tax Rate}}{(IPR_{1A})}$$

$$\underset{(FSPR_{1A})}{\underline{\hspace{4cm}}} = \underset{(FTAV)}{\underline{\hspace{4cm}}} \times \underset{(IPR_{1A})}{\underline{\hspace{4cm}}}$$

$$F(78B)\quad \frac{\text{Property Taxes for High School}}{(FSPR_{1B})} = \frac{\text{Assessed Valuation in Community}}{(FTAV)} \times \frac{\text{High School Total Tax Rate}}{(IPR_{1B})}$$

$$\underset{(FSPR_{1B})}{\underline{\hspace{4cm}}} = \underset{(FTAV)}{\underline{\hspace{4cm}}} \times \underset{(IPR_{1B})}{\underline{\hspace{4cm}}}$$

Source of Data

FTAV - Formula 54
IPR_{1A} - Input data, Section 6
IPR_{1B} - Input data, Section 6

FORMULA #79
TOTAL SCHOOL REVENUES

Revenues	Elementary	High School	Unified or Total
State per Pupil Allocation-F(74)	($FSAR_{1A}$)	($FSAR_{1B}$)	(FSAR)
State Equalization-F(75)	($FSER_{1A}$)	($FSER_{1B}$)	(FSER)
Other State Aid-F(76)	($FSOR_{1A}$)	($FSOR_{1B}$)	(FSOR)
Federal Aid-F(77)	($FSFR_{1A}$)	($FSFR_{1B}$)	(FSFR)
Property Taxes-F(78)	($FSPR_{1A}$)	($FSPR_{1B}$)	(FSPR)
F(79)Total Revenue	(FSR_{1A})	(FSR_{1B})	(FSR)

FORMULA #80
MUNICIPAL PROPERTY TAX

Property tax is locally determined based on the formula: Tax Revenue = Assessed Valuation x Operating Tax Rate. Assume present operating tax rate, applied to projected assessed valuation, to calculate potential revenue. It is also assumed the entire tax assessed will be collected.

Two methods can and should be used in calculating property tax income:

$$F(80)\qquad \frac{\text{Municipal Property Taxes}}{(FMPT)} = \frac{\text{Total Municipal Assessed Valuation}}{(FTMV)} \times \frac{\text{Municipal Property Tax Rate}}{(IPR_1)}$$

$$\frac{\qquad\qquad\qquad}{(FMPT)} = \frac{\qquad\qquad\qquad}{(FTMV)} \times \frac{\qquad\qquad\qquad\qquad}{(IPR_1)}$$

Source of Data

FTMV - Formula 54
IPR_1 - Input data, Section 7

FORMULA # 81
MUNICIPAL SALES TAX

Sales taxes may be imposed by the municipal government as allowed by state law. The amount of tax is directly related to the amount of retail sales. Taxable retail sales within a municipality are not subject to county sales taxes but would be subject to a state sales tax. For purpose of this analysis, it is assumed that all new taxable sales except those of the plant will occur in the municipality.

F (81)

$$\underset{\text{(FMST)}}{\underline{\text{Sales Tax}}} = \underset{\text{(FMTS)}}{\underline{\text{Taxable Retail Sales}}} \times \underset{(\text{ISR}_1)}{\underline{\text{Tax Rate}}} + \underset{\text{(IMSR)}}{\underline{\text{Existing Sales Tax Collections}}}$$

$$\underset{\text{(FMST)}}{\underline{\qquad\qquad}} = \underset{\text{(FMTS)}}{\underline{\qquad\qquad\qquad\qquad}} \times \underset{(\text{ISR}_1)}{\underline{\qquad\qquad}} + \underset{\text{(IMSR)}}{\underline{\qquad\qquad\qquad\qquad\qquad}}$$

F (81A)

$$\underset{\text{(FMTS)}}{\underline{\text{Taxable Retail Sales}}} = \underset{\text{(FRS)}}{\underline{\text{New Retail Sales}}} \times \underset{(\text{SF}_7)}{\underline{\text{Percent Taxable}}}$$

$$\underset{\text{(FMTS)}}{\underline{\qquad\qquad\qquad\qquad}} = \underset{\text{(FRS)}}{\underline{\qquad\qquad\qquad}} \times \underset{(\text{SF}_7)}{\underline{\qquad\qquad\qquad}}$$

Source of data:

SF_7 - Standard factor, Section 1
FRS - Formula 15
ISR_1 - Input data, Section 7
IMSR - Input data, Section 7

FORMULA #82
MUNICIPAL FRANCHISE TAX

A franchise tax is imposed by the municipality upon a utility for the privilege of doing business and utilizing city streets. The utilities included are electricity, natural gas, and telephone (water is assumed to be a city service).

Utility	Current Sales		New Sales		Total
Electricity	________	+	________	=	________
Natural Gas	________	+	________	=	________
Telephone	________	+	________	=	________
	________ (IUS_1)	+	________ (IUS_2)	=	________ (FMUS)

$$\text{(F82)} \quad \frac{\text{Franchise Tax}}{(\text{FMFT})} = \frac{\text{Total Utility Sales}}{(\text{FMUS})} \times \frac{\text{Franchise Tax Rate}}{(\text{IFR})}$$

$$\underset{(\text{FMFT})}{\underline{\qquad\qquad\qquad}} = \underset{(\text{FMUS})}{\underline{\qquad\qquad\qquad}} \times \underset{(\text{IFR})}{\underline{\qquad\qquad\qquad}}$$

Source of data

IUS_{1-2} - Input data, Section 7

IFR - Input data, Section 7

177

FORMULA #83
MUNICIPAL CIGARETTE TAX

Cigarette taxes are collected in North Dakota and Wyoming by the state for distribution to municipalities based on population or point of sale (which is estimated based on population):

$$F(83)\quad \frac{\text{Cigarette Tax}}{(\text{FMCT})} = \frac{\text{Total Population}}{(\text{FTP}_1)} \times \frac{\text{Allocation Per Capita}}{(\text{ICR})}$$

$$\frac{\qquad\qquad}{(\text{FMCT})} = \frac{\qquad\qquad}{(\text{FTP}_1)} \times \frac{\qquad\qquad}{(\text{ICR})}$$

Source of data

FTP_1 - Formula 11A
ICR - Input data, Section 7

FORMULA #84
ALCOHOLIC BEVERAGE TAX

Alcoholic beverage (or liquor license) taxes may be collected by states and distributed to cities and counties based on an allocation formula:

F(84) $$\frac{\text{Alcoholic Beverage Tax}}{(\text{FMLT})} = \frac{\text{Total Population}}{(\text{FTP}_1)} \times \frac{\text{Allocation Per Capita}}{(\text{ILR})}$$

$$\frac{\qquad\qquad\qquad}{(\text{FMLT})} = \frac{\qquad\qquad\qquad}{(\text{FTP}_1)} \times \frac{\qquad\qquad\qquad}{(\text{ILR})}$$

Source of data

FTP_1 - Formula 11A
ILR - Input data, Section 7

FORMULA #85
AUTO-IN-LIEU TAX

An auto in-lieu tax (or motor vehicle license tax) may be collected by the state and allocate to cities based on population:

$$F(85)\ \frac{\text{Auto In-Lieu Tax}}{(\text{FMAT})} = \frac{\text{Total Population}}{(\text{FTP}_1)} \times \frac{\text{Allocation Per Capita}}{(\text{IAR})}$$

$$\frac{\qquad\qquad}{(\text{FMAT})} = \frac{\qquad\qquad}{(\text{FTP}_1)} \times \frac{\qquad\qquad}{(\text{IAR})}$$

Source of data

FTP_1 - Formula 11A
IAR - Input data, Section 7

180

FORMULA #86
MUNICIPAL MOTOR FUEL SALES TAX

Taxes on the sale of gasoline are collected by the state with a portion of that often allocate to cities on the basis of population:

$$F(86)\ \frac{\text{Motor Fuel Sales Tax}}{(\text{FMGT})} = \frac{\text{Total Population}}{(\text{FTP}_1)} \times \frac{\text{Allocation Per Capita}}{(\text{IGR})}$$

$$\frac{\rule{4cm}{0pt}}{(\text{FMGT})} = \frac{\rule{3cm}{0pt}}{(\text{FTP}_1)} \times \frac{\rule{4cm}{0pt}}{(\text{IGR})}$$

Source of data

FTP_1 - Formula 11A
IGR - Input data, Section 7

181

FORMULA #87
MUNICIPAL INSURANCE PREMIUMS TAX

Proceeds from taxes on fire and motor vehicle insurance are collected by the state and al located to cities based on either population or premiums paid. Population is used for estimatin the latter:

$$F(87)\quad \frac{\text{Insurance Premiums Tax}}{(\text{FMIT})} = \frac{\text{Total Population}}{(\text{FTP}_1)} \times \frac{\text{Allocation Per Capita}}{(\text{IIR})}$$

$$\frac{\rule{4cm}{0.4pt}}{(\text{FMIT})} = \frac{\rule{3cm}{0.4pt}}{(\text{FTP}_1)} \times \frac{\rule{4cm}{0.4pt}}{(\text{IIR})}$$

Source of data

FTP_1 - Formula 11A
IIR - Input data, Section 7

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FORMULA #88
OTHER STATE SUBVENTIONS

Other forms of state financial assistance to the municipality for operating purposes must b identified by the researcher and calculated for the total population of the community or the basis upon which the subvention is provided:

	Item	Amount
F(88)		
	Total	(FMOT)

Note: Check out severance taxes, bank income taxes, and other listed revenues of existing city.

FORMULA #89
MUNICIPAL WATER SALES

Water sales are normally designed to cover the full cost of constructing and operating the water system. For this analysis, it is possible to project water operating income to be equivalent to water and sewer operating costs.

F (89) $$\frac{\text{Water Sales}}{\text{(FMWS)}} = \frac{\text{Water Operating Costs}}{\text{(FMWE)}} + \frac{\text{Sewage Disposal Costs}}{\text{(FMDE)}}$$

$$\frac{\qquad\qquad}{\text{(FMWS)}} = \frac{\qquad\qquad\qquad\qquad}{\text{(FMWE)}} + \frac{\qquad\qquad\qquad\qquad}{\text{(FMDE)}}$$

Alternate Method:

F (89A) $$\frac{\text{Water Sales}}{\text{(FMWS)}} = \frac{\text{Total Municipal Number of Households}}{(FPO_{2A})} \times \frac{\text{Average Cost Per Household}}{\text{(IWR)}}$$

$$\frac{\qquad\qquad}{\text{(FMWS)}} = \frac{\qquad\qquad\qquad\qquad\qquad\qquad}{(FPO_{2A})} \times \frac{\qquad\qquad\qquad\qquad\qquad}{\text{(IWR)}}$$

Source of data

FMWE - Formula 57
FMDE - Formula 58
FPO_{2A} - Formula 9A
IWR - Input data, Section 7

FORMULA #90
MUNICIPAL SANITATION FEES

Charges for refuse collection if assessed, are designed to cover the cost of operation and therefore a estimated to equal the sanitation operating costs.

$$F(90)\ \frac{\text{Sanitation Fees}}{\text{(FMGS)}} = \frac{\text{Sanitation Operating Cost}}{\text{(FMGE)}}$$

$$\frac{\underline{\qquad\qquad}}{\text{(FMGS)}} \qquad \frac{\underline{\qquad\qquad\qquad}}{\text{(FMGE)}}$$

Source of data

FMGE - Formula 59

FORMULA #91
MUNICIPAL BUSINESS LICENSE FEES

Business license fees are imposed by each city at a rate established by the legislative body. For estimating purposes, these fees may be calculated at a ratio of retail sales to business licenses:

$$\text{F(91)} \quad \frac{\text{Business License Fees}}{\text{(FMBR)}} = \frac{\text{Total Retail Sales}}{\text{(FRT)}} \times \frac{\text{Business License Ratio}}{\text{(IBR)}}$$

$$\frac{\qquad\qquad\qquad}{\text{(FMBR)}} = \frac{\qquad\qquad}{\text{(FRT)}} \times \frac{\qquad\qquad\qquad}{\text{(IBR)}}$$

Source of data

FRT - Formula 16
IBR - Input data, Section 7

FORMULA #92
OTHER MUNICIPAL REVENUES

Other miscellaneous revenues include charges for services, licenses and permits, interest, and minor income. For purposes of this analysis, these revenues may be calculated as a percentage of municipal revenues previously projected:

$$F(92)\quad \frac{\text{Other Revenues}}{(\text{FMOR})} = \frac{\text{Subtotal Municipal Revenues}}{(\text{FMSR})} \times \frac{\text{Ratio of Other Revenues to Subtotal Revenues}}{(\text{IOR}_1)}$$

$$\frac{\qquad\qquad}{(\text{FMOR})} = \frac{\qquad\qquad\qquad}{(\text{FMSR})} \times \frac{\qquad\qquad\qquad\qquad}{(\text{IOR}_1)}$$

Source of data

FMSR - Formula 93
IOR_1 - Input data, Section 7

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FORMULA #93
TOTAL MUNICIPAL REVENUES

Revenue	Amount	Source
Property Taxes (at current rate)	(FMPT)________________	F(80)
Sales Tax	(FMST)________________	F(81)
Franchise Tax	(FMFT)________________	F(82)
Cigarette Tax	(FMCT)________________	F(83)
Alcoholic Beverage Tax	(FMLT)________________	F(84)
Auto In-Lieu Tax	(FMAT)________________	F(85)
Motor Fuel Sales Tax	(FMGT)________________	F(86)
Insurance Premiums Tax	(FMIT)________________	F(87)
Other State Subventions	(FMOT)________________	F(88)
Water Sales	(FMWS)________________	F(89)
Sanitation Fees	(FMGS)________________	F(90)
Business License Fees	(FMBR)________________	F(91)
Subtotal	(FMSR)________________	
Other Revenues	(FMOR)________________	F(92)
F(93) Total	(FMTR)________________	

FORMULA #93 (Continued)

Alternate Method:

As a check on the reasonableness of the total above F(71), total municipal revenues may be calculated based on statewide averages:

$$F(93A)\ \frac{\text{Total Revenues}}{(FMTR)} = \frac{\text{Total Population}}{(FTP_1)} \times \frac{\text{Revenue Per Capita}}{(IRR_1)}$$

$$\frac{\qquad\qquad\qquad}{(FMTR)} \qquad \frac{\qquad\qquad\qquad}{(FTP_1)} \qquad \frac{\qquad\qquad\qquad}{(IRR_1)}$$

Source of data

FTP_1 - Formula 11A
IRR_1 - Input data, Section 7

FORMULA #94
COUNTY PROPERTY TAX

Property tax is locally determined based on the formula: Tax Revenue = Assessed Valuation x Operating Tax Rate. Assume present operating tax rate, applied to projected assessed valuation, to calculate potential revenue. It is also assumed the entire tax assessed will be collected.

$$F(94)\quad \frac{\text{County Property Taxes}}{(\text{FCPT})} = \frac{\text{Total County Assessed Valuation}}{(\text{FTAV})} \times \frac{\text{County Property Tax Rate}}{(\text{IPR}_2)}$$

$$\frac{\qquad\qquad}{(\text{FCPT})} = \frac{\qquad\qquad}{(\text{FTAV})} \times \frac{\qquad\qquad}{(\text{IPR}_2)}$$

Source of Data

FTAV - Formula 54
IPR2 - Input data, Section 8

FORMULA #95
COUNTY SALES TAX

Sales taxes may be imposed by the county government as allowed by state law. The amount of tax is directly related to the amount of sales. For purposes of this analysis assume company taxable sales are subject to the county sales tax and not the city sales tax. Taxable retail sales within a county would be subject to a state sales tax as well.

F(95) Sales Tax = Local Estimate

Sales Tax = ________________

Alternative Methods:

F(95A) $\underset{\text{(FCST)}}{\underline{\text{Sales Tax}}} = \underset{\text{(C5)}}{\underline{\text{Projected Company County Sales Tax}}} + \underset{\text{(ICSR)}}{\underline{\text{Existing County Sales Tax Collections}}}$

$\underset{\text{(FCST)}}{\underline{\qquad\qquad}} = \underset{\text{(C5)}}{\underline{\qquad\qquad\qquad\qquad}} + \underset{\text{(ICSR)}}{\underline{\qquad\qquad\qquad\qquad}}$

$$\text{F(95B)} \quad \frac{\text{Sales Tax}}{(\text{FCST})} = \frac{\begin{array}{c}\text{Company Sales}\\ \text{Subject to Tax}\end{array}}{(C_5)} + \frac{\begin{array}{c}\text{County}\\ \text{Tax Rate}\end{array}}{(\text{ISR}_2)} + \frac{\begin{array}{c}\text{Existing County Sales}\\ \text{Tax Collections}\end{array}}{(\text{ICSR})}$$

$$\frac{\qquad\qquad}{(\text{FCST})} = \frac{\qquad\qquad\qquad}{(C_5)} + \frac{\qquad\qquad}{(\text{ISR}_2)} + \frac{\qquad\qquad\qquad\qquad}{(\text{ICSR})}$$

Source of Data

C_5 - Company input data, Chapter IV
ICSR - Input data, Section 8
ISR_2 - Input data, Section

FORMULA #96
COUNTY FRANCHISE TAX

A franchise tax may be imposed by the county upon a utility for the privilege of doing business and utilizing county roads. The utilities included are electricity, natural gas, and telephone.

Utility	Current Sales		New Sales		Total
Electricity	________	+	________	=	________
Natural Gas	________	+	________	=	________
Telephone	________	+	________	=	________
TOTAL	________ (IUS_3)	+	________ (IUS_4)	=	________ (FCUS)

F(96) $\frac{\text{Franchise Tax}}{\text{(FCFT)}} = \frac{\text{Total Utility Sales}}{\text{(FCUS)}} \times \frac{\text{Franchise Tax Rate}}{\text{(IFR)}}$

$\frac{\_\_\_\_\_\_\_\_}{\text{(FCFT)}} = \frac{\_\_\_\_\_\_\_\_}{\text{(FCUS)}} \times \frac{\_\_\_\_\_\_\_\_}{\text{(IFR)}}$

Source of data

IUS_3 = Input data, Section 8
IUS_4 = Input data, Section
IFR = Input data, Section 7

FORMULA #97
COUNTY CIGARETTE TAX

Cigarette taxes may be collected by the state for distribution to counties based on population or point of sale (which is estimated based on population).

$$F(97)\quad \frac{\text{Cigarette Tax}}{(\text{FCCT})} = \frac{\text{Total Population}}{(\text{FTP}_2)} \times \frac{\text{Allocation per Capita}}{(\text{ICR})}$$

$$\frac{\rule{3cm}{0pt}}{(\text{FCCT})} = \frac{\rule{3cm}{0pt}}{(\text{FTP}_2)} \times \frac{\rule{3cm}{0pt}}{(\text{ICR})}$$

Source of data

FTP_2 = Formula 11B
ICR = Input data, Section 7

FORMULA #98
COUNTY ALCOHOLIC BEVERAGE TAX

Alcohol beverage (or liquor license) taxes may be collected by states and distributed to citi and counties based on an allocation formula--either population or estimated from population.

$$F(98)\quad \underset{\text{(FCLT)}}{\underline{\text{Alcoholic Beverage Tax}}} = \underset{(\text{FTP}_2)}{\underline{\text{Total Population}}} \times \underset{\text{(ILR)}}{\underline{\text{Allocation per Capita}}}$$

$$\underset{\text{(FCLT)}}{\underline{\hspace{8em}}} = \underset{(\text{FTP}_2)}{\underline{\hspace{6em}}} \times \underset{\text{(ILR)}}{\underline{\hspace{7em}}}$$

Source of data

FTP_2 - Formula 11B
ILR - Input data, Section 7

FORMULA #99
COUNTY AUTO-IN-LIEU TAX

An auto in-lieu tax (or motor vehicle license tax) may be collected by the state and allocate to counties based on population.

F(99) $$\frac{\text{Auto In-Lieu Tax}}{(\text{FCAT})} = \frac{\text{Total Population}}{(\text{FTP}_2)} \times \frac{\text{Allocation per Capita}}{(\text{IAR})}$$

$$\frac{\rule{6em}{0.4pt}}{(\text{FCAT})} = \frac{\rule{6em}{0.4pt}}{(\text{FTP}_2)} \times \frac{\rule{6em}{0.4pt}}{(\text{IAR})}$$

Source of data

FTP_2 - Formula 11B
IAR - Input data, Section 7

FORMULA #100
COUNTY MOTOR FUEL SALES TAX

Taxes on the sale of gasoline are collected by the state with a portion of that often allocated to counties on the basis of population.

$$F(100)\quad \frac{\text{Motor Fuel Sales Tax}}{(\text{FCGT})} = \frac{\text{Total Population}}{(\text{FTP}_2)} \times \frac{\text{Allocation per Capita}}{(\text{IGR})}$$

$$\frac{\hspace{4cm}}{(\text{FCGT})} = \frac{\hspace{3cm}}{(\text{FTP}_2)} \times \frac{\hspace{4cm}}{(\text{IGR})}$$

Source of data

FTP_2 - Formula 11B
IGR - Input Section, Section 7

FORMULA #101
COUNTY INSURANCE PREMIUMS TAX

Proceeds from taxes on fire and motor vehicle insurance may be collected by the state and allocated to county based on either population or premiums paid. Population is used for estimating the latter.

$$F(101)\quad \frac{\text{Insurance Premiums Tax}}{(\text{FCIT})} = \frac{\text{Total Population}}{(\text{FTP}_2)} \times \frac{\text{Allocation per Capita}}{(\text{IIR})}$$

$$\frac{\qquad\qquad}{(\text{FCIT})} = \frac{\qquad\qquad}{(\text{FTP}_2)} \times \frac{\qquad\qquad}{(\text{IIR})}$$

Source of data

FTP_2 - Formula 11B
IIR - Input data, Section 7

FORMULA #102
STATE PUBLIC WELFARE REIMBURSEMENT

States generally pay a proportion of the total cost of public welfare administered by the counties. This allocation is composed of funds from both the Federal and state governments.

For estimating purposes, the average share of public welfare costs paid to counties by the state will be used.

$$F(102)\quad \frac{\text{State Public Welfare}}{(\text{FCWR})} = \frac{\text{County Welfare Expenditures}}{(\text{FPWE})} \times \frac{\text{State Share}}{(\text{IRR}_2)}$$

$$\frac{\qquad\qquad\qquad}{(\text{FCWR})} = \frac{\qquad\qquad\qquad\qquad}{(\text{FPWE})} \times \frac{\qquad\qquad}{(\text{IRR}_2)}$$

Source of data

FPWE = Formula 67
IRR_2 = Input data, Section 8

FORMULA #103
STATE LOSS OF REVENUE REIMBURSEMENT

In some states, the state government reimburses counties for the loss of property tax revenue caused by state mandated exemptions, e.g., veterans' exemption.

The amount of this reimbursement is related to the total assessed valuation, and is based on a statewide average.

$$F(103)\quad \underset{\text{(FCLR)}}{\underline{\text{State Loss of Revenue}}} = \underset{\text{(FTAV)}}{\underline{\text{Total Assessed Valuation}}} \times \underset{(IRR_3)}{\underline{\text{Percentage Allocation}}}$$

$$\underset{\text{(FCLR)}}{\underline{\hspace{4cm}}} = \underset{\text{(FTAV)}}{\underline{\hspace{4cm}}} \times \underset{(IRR_3)}{\underline{\hspace{4cm}}}$$

Source of data

FTAV - Formula 54
IRR_3 - Input data, Section 8

FORMULA #104
OTHER STATE SUBVENTIONS

Other forms of state financial assistance to the county for operating purposes must be identified by the researcher and calculated for the total population of the community or the basis upon which the subvention is provided:

	Item	Amount
	________	________
F(104)	________	________
	________	________
	Total	________ (FCOT)

Note: Check out severance taxes, bank income taxes, and other listed revenues of existing county.

FORMULA #105
OTHER COUNTY REVENUES

Other miscellaneous revenues include charges for service, licenses and permits, interest, and minor income. For purposes of the analysis, these revenues may be calculated as a percentage of county revenues previously projected.

$$\text{F(105)}\ \frac{\text{Other Revenues}}{(\text{FCOR})} = \frac{\text{Subtotal County Revenues}}{(\text{FCTR})} \times \frac{\text{Current Ratio of Other Revenues to Revenues}}{(\text{IOR}_2)}$$

$$\frac{\qquad\qquad}{(\text{FCOR})} = \frac{\qquad\qquad}{(\text{FCTR})} \times \frac{\qquad\qquad}{(\text{IOR}_2)}$$

Source of data

FCTR = Formula 106
IOR_2 = Input data, Section 8

FORMULA #106
TOTAL COUNTY REVENUES

Revenue	Amount	Source
Property Tax (at present rate)	(FCPT)__________	F(94)
Sales Tax	(FCST)__________	F(95)
Franchise Tax	(FCFT)__________	F(96)
Cigarette Tax	(FCCT)__________	F(97)
Alcoholic Beverage Tax	(FCLT)__________	F(98)
Auto In-Lieu Tax	(FCAT)__________	F(99)
Motor Fuel Sales Tax	(FCGT)__________	F(100)
Insurance Premium Tax	(FCIT)__________	F(101)
State Public Welfare	(FCWR)__________	F(102)
State Loss of Revenue	(FCLR)__________	F(103)
Other State Subventions	(FCOT)__________	F(104)
Subtotal	(FCSR)__________	
Other Revenue	(FCOR)__________	F(105)
F(106) Total	(FCTR)__________	

FORMULA #106 (Continued)

Alternate Method:

As a check on the reasonableness of the total above F(106), total county revenues may be calculated based on statewide averages:

$$\text{F(106B)} \quad \frac{\text{Total County Revenues}}{\text{(FCTR)}} = \frac{\text{Total County Population}}{\text{(FTP)}} \times \frac{\text{Revenues Per Capita}}{(\text{IRR}_4)}$$

$$\frac{\qquad\qquad\qquad}{\text{(FCTR)}} = \frac{\qquad\qquad\qquad}{\text{(FTP)}} \times \frac{\qquad\qquad\qquad}{(\text{IRR}_4)}$$

Source of data

FTP - Formula 11
IRR_4 - Input data, Section 8

VIII. CONSTRUCTION

Accurate evaluation of socioeconomic impact requires that the model be solved for two cases for each geographical area being assessed:

- A "steady state" or normal operating mode for the new plant and related facilities--after construction is complete. This "steady state" has been analysed in Chapters V-VII.
- The construction period, covered in this chapter.

1. THE CONSTRUCTION PERIOD IS INTENSE AND DISRUPTIVE

The construction period involves a short period of intense activity and the most severe economic dislocations. Construction activity is characterized by a rapid climb in employment to a peak level, followed by a similarly rapid decline. Accommodations and services for construction personnel and their families (such as housing, schools, government services) are substantially more difficult for the affected areas to provide because of:

- Demand for the facilities builds up very rapidly once construction starts.
- Peak construction employment is generally many times as great as operating employment--meaning the short turn demand for facilities will be much greater then the long term.
- The "wind-down" in construction employment (and hence demand for facilities) is as rapid as the start-up period, allowing minimum time to adjust to the new lower demand for services and facilities.

- The traditional means of providing and financing both public and privately supplied facilities and services are not suited to meet the massive fluctuations in demand characteristics of large scale construction activity in sparsely populated areas. Construction workers will not buy new permanent homes if there will be no resale market at the end of the construction period. Successful local government financing of new schools and facilities depends upon the long term residence (and tax revenues) of the persons for whom the facilities are being provided.

Employment toward the end of the construction period overlaps with the build up of operating personnel who will run the plant. Exhibit V graphs a typical employment build-up at a coal gasification plant built concurrently with a new town to house the employees.

If sufficient work is anticipated to keep the construction work force in the immediate area for fifteen to twenty years (i.e., if a series of new plants are anticipated within the same area) construction workers and their families will be around sufficiently long to be considered part of the new permanent population for planning purposes. In this case, many of the traditional means of providing new services and facilities will apply.

2. FAMILY CHARACTERISTICS OF THE CONSTRUCTION LABOR FORCE ARE DIFFERENT THAN FOR THE PERMANENT WORK FORCE

Because of the temporary nature of many of the assignments, and the lack of available housing, construction workers are less likely to bring their families to the site than are permanent employees. Furthermore, a much higher percentage of construction employees are single.

EXHIBIT V

Old West Regional Commission

WORK FORCE DYNAMICS

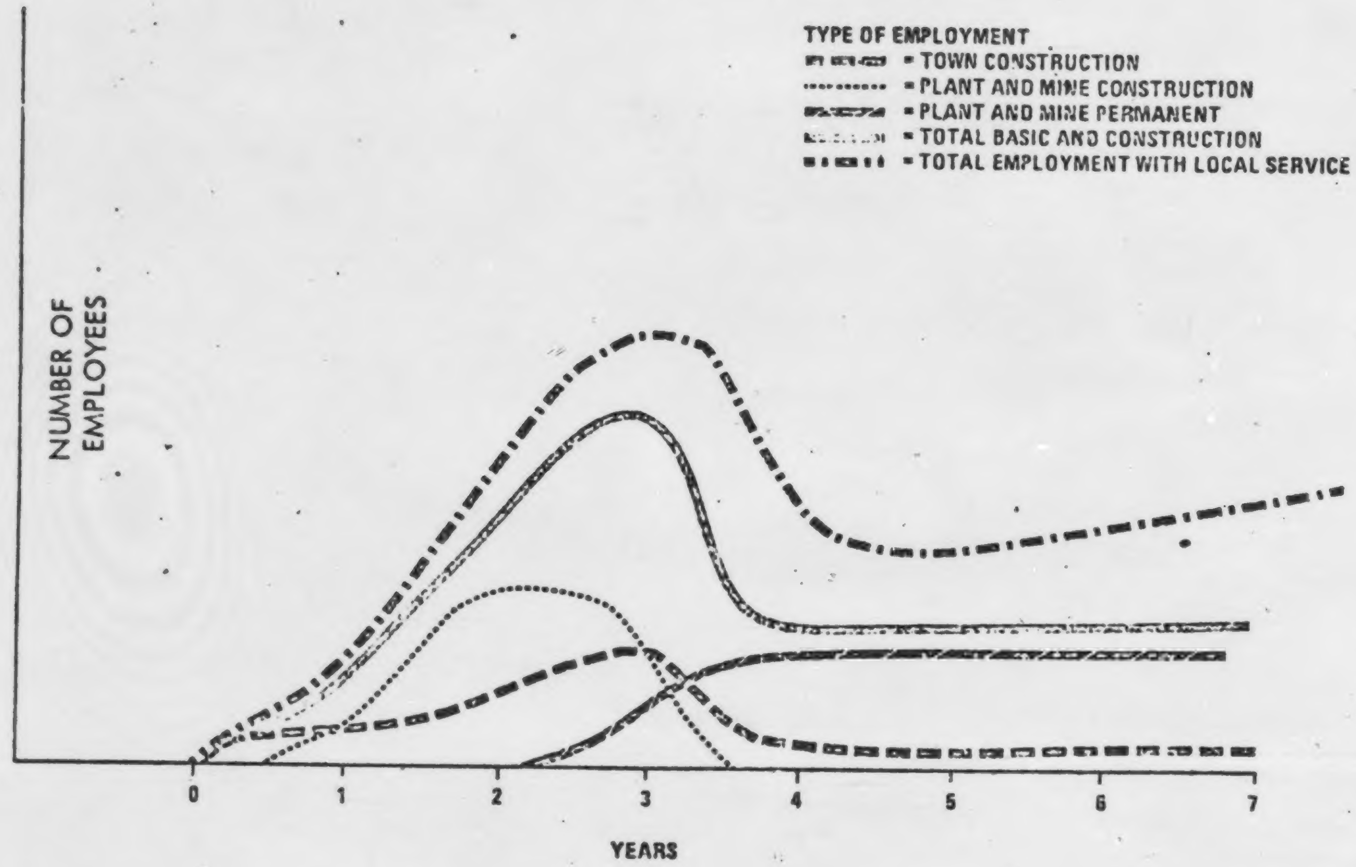

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EXHIBIT VI

Old West Regional Commission

CONSTRUCTION FORCE CHARACTERISTICS

		Month						
		6	12	18	24	30	36	42
Family Characteristics								
Single, Without Dependents	@ 1	20%	15%	15%	15%	10%	5%	2.5%
Married, Without Dependents	@ 1	15	10	10	5	5	5	2.5
Married, With Dependents	@ 3.5	65	75	75	80	85	90	95
Average Family Size		2.6	2.9	2.9	3.0	3.2	3.2	3.3
Base/Nonbase Ratio		1:0.12	1:0.15	1:0.20	1:0.25	1:0.30	1:0.30	1:0.30
Population/100 Base Employees		304.5	340.0	357.5	387.5	422.5	430.0	442.5
Base		262.5	287.5	287.5	300.0	317.5	325.0	337.5
Nonbase		42.0	52.5	70.0	87.5	105.0	105.0	105.0
Number of Students/Base Employees		1.04	1.22	1.28	1.42	1.55	1.62	1.69
Elementary @ 75%		.78	.92	.96	1.06	1.16	1.22	1.27
High School @ 25%		.26	.30	.32	.36	.39	.40	.42
Number of Students/Family		1.35	1.35	1.35	1.35	1.35	1.35	1.35
Elementary @ 75%		1.01	1.01	1.01	1.01	1.01	1.01	1.01
High School @ 25%		.34	.34	.34	.34	.34	.34	.34

Source: Booz, Allen & Hamilton, Inc.

The characteristics of the construction labor force change over the construction phase. These changes are shown in Exhibit VI, which presents the characteristics of the labor force currently completing the Navajo Generating Station in Page, Arizona. Page is a remote location with small existing base employment similar in size to many communities in the Old West Region.

The phasing of the total construction work force will be calculated in Exhibit VII.

3. NONBASE EMPLOYMENT IS LIMITED DURING THE CONSTRUCTION PHASE

The number of nonbase jobs created during the construction phase is limited by several factors:

- Detail and service businesses do not want to construct facilities which will be excessive after construction ends.
- There is always a lag between the generation of demand and the meeting of need.
- Typically, the growth of secondary employment is inhibited in remote locations by the lack of housing for new nonbase workers.

For Page, Arizona the following base/nonbase ratios were estimated, but a faster build-up may be experienced in the Old West Region.

Year	Base Employment	Base/Nonbase Ratio
1	33-450	1:.12
2	566-1302	1:.15
3	1349-1972	1:.20
4	1833-1560	1:.25

Source: Bechtel Corporation

EXHIBIT VII

Old West Regional Commission

CONSTRUCTION FORCE PHASING

Plant and Mine Construction Work Force - Chapter IV

Community Construction = Total Construction Value from Chapter VI ÷ \$30,000[1]/man year

Month	Plant		Mine		Community		Construction Worker Phasing
6		+		+	(X. 15)	=	
12		+		+	(X. 25)	=	
18		+		+	(X. 30)	=	
24		+		+	(X. 35)	=	
30		+		+	(X. 45)	=	
36		+		+	(X. 40)	=	
42		+		+	(X. 10)	=	

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[1] 1973 Statistical Abstract of the U.S.

Total value of construction in 1972 =	\$123,836,000
Preliminary data from 1972 Census of Business	
Total construction employees =	4,224,718
Total construction workers =	3,548,722

Researcher may derive a value/man year for applicable state

The base/nonbase ratio during construction of the Vidal Nuclear Generating Station is projected by Booz, Allen & Hamilton to be between 1:0.24 and 1:0.34.

In addition, the major portion of nonbase jobs created by the construction work force will be filled by local employment of construction workers or by their dependents. This is taken into account above, eliminating the need to calculate employees per household.

4. HOUSING WILL LARGELY BE TEMPORARY

The provision of adequate housing for construction personnel of the coal utilization facility is a matter of primary concern. Estimating demand is relatively easy, related directly to employment levels. Allocating this among single family, multi-family, mobile homes and group quarters is more difficult, requiring the use of several assumptions. For purposes of this analysis, the following assumptions will be used.

- The initial work force will absorb all available vacant units.
- Single workers can be accommodated in group quarters at the construction site.
- Married workers without dependents could live in group quarters or multi-family units
- Married workers with dependents could live in single family, multi-family units, or mobile homes.
- The number of new single family and multi-family units constructed will not exceed the number required for the permanent work force. (This assumes construction workers would be the initial occupants and permanent workers the subsequent occupants).

- Families of construction workers not able to live in single or multi-family units will live in mobile homes.

- The number of permanent mobile home pads will not exceed the number required for the permanent work force.

- Mobile home pads required above the permanent number would be in temporary parks.

- Single and multi-family units cannot be available until at least one year after start of construction, while mobile home pads and group quarters can be available within six months.

- Availability of permanent housing for construction workers could be at the following percentage of total new construction (from Chapter V).

Month	Percent Available
6	0%
12	10%
18	25%
24	40%
30	80%
36	90%
42	100%

5. INFRASTRUCTURE AND PUBLIC FACILITIES WILL BE PROVIDED BY PERMANENT AND TEMPORARY MEANS

Areas anticipating a short period of major new construction activity must plan for temporary facilities. Permanent new facilities and services must be provided for new permanent population projected to result from the plant's "steady state" impacts. Permanent facilities to meet anticipated long term demands can be built at the start of the plant construction period. These facilities can then satisfy part of the short term demands of the construction force prior to the arrival of the new permanent residents.

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The difference between peak short term demand for facilities and services during the construction period and the anticipated new long term ("steady state") demand after the construction period must be provided for on a temporary basis. This demand can be met by:

- Mobile facilities (mobile homes, pre-fab units, etc.) moved into and out of the area as needed, and/or
- Expanded use of existing facilities (schools can be run on double shifts, classrooms can be set up in churches or community buildings, etc.) and/or
- Overcrowding, congestion, and reduction of service levels

Generally, infrastructure serving housing units will be permanent for the projected permanent units and temporary for the projected temporary units. For example, a temporary sewage disposal system can be installed for the temporary mobile home park, and the park can hook up to the existing water system. Electricity and telephone can be provided in temporary fashion. No natural gas would be provided, rather fuel gas would be used.

The temporary mobile home park(s) could be served by the existing fire, police, health and general government facilities. A park could be constructed within the area.

6. CONSTRUCTION WORKERS WILL LOCATE WHERE HOUSING IS PROVIDED

The place in which construction workers will live is dictated almost entirely by the location of available housing units or mobile home pads. For purposes of this analysis, several assumptions are made and one major judgment is required by the researcher:

- Group quarters will be located at the construction site. These are temporary and will be removed at the end of the construction period.
- Single family, multi-family and permanent mobile home pads will be located within the community, allocated to the city and remainder of community in the same proportion as projected in Chapter V.
- Temporary mobile home pads can be provided in either:
  - City
  - Remainder of community
  - At plant site

There are significant advantages (and precedents) for the creation of a temporary mobile home park(s) for construction workers which would be completely removed at the end of construction. If only one plant is to be build in the community, the location might properly be at that plant site, so as to assure its ultimate removal by the company. If, on the other hand, several plants will be built over a period of time and the temporary facility will serve each of them, a more central location such as the city may be more appropriate.

7. ADDED PUBLIC OPERATING COSTS DURING THE CONSTRUCTION PHASE ARE ESTIMATED IN GENERAL TERMS

The impact of added construction workers, their families and new nonbase employees, on the community, city and schools are intense, and complicated by several factors:

- New public facilities, e.g., police and fire stations, parks, and hospitals, are unlikely to be ready during the construction phase

- Adding personnel will very likely lag seriously behind the influx of population.
- Service increases will be seriously hampered by lack of available local revenue and state subventions.
- Most communities involved have little experience in responding to intense construction build-ups and declines.
- There will be a reluctance to create staffs or services exceeding the level required during the steady state.

In this manual, the added costs of public services are generalized in two ways. First, the estimates are made for city and county expenditures as a whole rather than the detailed breakdown of the steady state period. Included in each of these as operating costs are the needs to lease or purchase temporary facilities, e.g. sewage treatment plants or classrooms.

Construction phase expenditures are aggregated for the entire period of approximately three to four years. Difficulties of determining construction start dates, phasing of construction and residential locations do not warrant attempting to estimate annual costs. In order to aggregate these costs, each six-month reference point in the formulae is projected to represent six months of the construction phase. The numbers of persons, pupils or housing units at each point are added together, multiplied by six to get the forty-two month total, and divided by twelve to obtain an annual expenditure level.

FORMULA #107
CONSTRUCTION-SINGLE, WITHOUT DEPENDENTS

These formulae apply the percentage of single workers without dependents to the total construction work force.

Month	Construction Workers (Exhibit VII)	x	Percent Single (Exhibit VI)	=	Number Single Without Dependents
6	__________	x	.20	=	__________
12	__________	x	.15	=	__________
18	__________	x	.15	=	__________
24	__________	x	.15	=	__________
30	__________	x	.10	=	__________
36	__________	x	.05	=	__________
42	__________	x	.025	=	__________

FORMULA #108
CONSTRUCTION-MARRIED, WITHOUT DEPENDENTS

These formulae apply the percentage of married workers without dependents to the total construction work force.

Month	Construction Workers (Exhibit VII)		Percent Married Without Dependents (Exhibit VI)		Number Married Without Dependents
6		x	.15	=	
12		x	.10	=	
18		x	.10	=	
24		x	.05	=	
30		x	.05	=	
36		x	.05	=	
42		x	.025	=	

FORMULA #109
CONSTRUCTION-MARRIED, WITH DEPENDENTS

These formulae apply the percentage of married workers with their families to the total co struction work force.

Month	Construction Workers (Exhibit VII)	x	Percent Married With Dependents (Exhibit VI)	=	Number Married With Dependents
6		x	.65	=	
12		x	.75	=	
18		x	.75	=	
24		x	.80	=	
30		x	.85	=	
36		x	.90	=	
42		x	.95	=	

FORMULA #110
NEW NONBASE EMPLOYMENT

New nonbase employment is calculated on the ratio of base to nonbase employment projected for each period of time.

Month	Construction Workers (Exhibit VII)		Base/Nonbase Ratio (Exhibit VI)		New Nonbase Employment
6		x	.12	=	
12		x	.15	=	
18		x	.20	=	
24		x	.25	=	
30		x	.30	=	
36		x	.30	=	
42		x	.30	=	

FORMULA #111
TOTAL NEW EMPLOYMENT DURING CONSTRUCTION

New employment during construction attributable to coal utilization consists of base construction workers and new nonbase employees.

Construction Workers (Exhibit VIII) + New Nonbase Employment F (110) = Total New Employment

Month

6 ____________________ + ____________________ = ____________________

12 ____________________ + ____________________ = ____________________

18 ____________________ + ____________________ = ____________________

24 ____________________ + ____________________ = ____________________

30 ____________________ + ____________________ = ____________________

36 ____________________ + ____________________ = ____________________

42 ____________________ + ____________________ = ____________________

FORMULA #112
NEW POPULATION DURING CONSTRUCTION

New population is projected based on one person for single and married workers without dependents and a standard family size for married workers with dependents and nonbase employees.

Month	Single Workers Without Dependents F(107)		Married Workers Without Dependents F(108)		(Married Workers With Dependents F(109)		New Nonbase Employees) F(110)		Average Family Size (Ex. VI)		Total New Population During Construction
6		+		+		+		x	2.6	=	
12		+		+		+		x	2.9	=	
18		+		+		+		x	2.9	=	
24		+		+		+		x	3.0	=	
30		+		+		+		x	3.2	=	
36		+		+		+		x	3.2	=	
42		+		+		+		x	3.3	=	

Aggregation (Σ) = ________

FORMULA #113
HOUSING USE-SINGLE FAMILY

These formulae assumes that construction workers with dependents and nonbase employees with families will occupy all the permanent single family housing available.

Month	New Single Family F(19)		Percent Available (Chapter VIII)		Single Family Use
6		x	0	=	
12		x	.10	=	
18		x	.25	=	
24		x	.40	=	
30		x	.80	=	
36		x	.90	=	
42		x	1.0	=	

FORMULA #114

HOUSING USE-MULTI-FAMILY

These formulae assume that construction and nonbase employees will occupy all the permanent multi-family housing available.

Month	New Multi-Family F (20)		Percent Available (Chapter VIII)		Multi-Family Use
6		x	0	=	
12		x	.10	=	
18		x	.25	=	
24		x	.40	=	
30		x	.80	=	
36		x	.90	=	
42		x	1.0	=	

FORMULA #115
HOUSING USE-MOBILE HOMES

All employees and families not able to live in single family, multi-family, or group quarters will be required to live in mobile homes.

Month	Married Workers With Dependents F(109)	+	Married Workers Without Dependents F(108)	+	New Nonbase Employees F(110)	-	Single Family Housing F(113)	-	Multi-Family Housing F(114)	=	Mobile Home Use
6		+		+		-		-		=	
12		+		+		-		-		=	
18		+		+		-		-		=	
24		+		+		-		-		=	
30		+		+		-		-		=	
36		+		+		-		-		=	
42		+		+		-		-		=	

FORMULA #116
TOTAL HOUSING USE

The total housing demand at each six-month interval will combine demand for single family, multi-family, mobile home, and group quarters. (Demand for group quarters is assumed equivalent to single workers without dependents.) The total housing demand should be equivalent to total new employment (Formula #111). No provision is made for vacancy, as demand pressures will forego that.

Month	Single Family Use F(113)	+	Multi-Family Use F(114)	+	Mobile Home Demand F(115)	+	Group Quarters F(107)	=	Total Housing Use
6		+		+		+		=	
12		+		+		+		=	
18		+		+		+		=	
24		+		+		+		=	
30		+		+		+		=	
36		+		+		+		=	

FORMULA #117
MOBILE HOME SITE DEMAND

Each new mobile home will require a site. This analysis assumes that permanent sites will be created by Month 6 up to the number required for the permanent labor force (Formula 22). All additional needed sites will be temporary. There may be mobile home sites available and vacant at the start of construction.

Month	Mobile Home Demand F(115)		Projected Permanent Sites F (22)		Temporary Mobile Home Sites
6		-		=	
12		-		=	
18		-		=	
24		-		=	
30		-		=	
36		-		=	
42		-		=	

FORMULA #118
HOUSING IN CITY

Allocating construction housing between the city and the remainder of the community is extremely difficult. The phasing of single family and multi-family units and mobile home parks is unknown. These formulae assume the same rates for these units as in the steady state while group quarters are located in "Remainder of the Community." The temporary mobile home park is added only if it is located in the city rather than the plant site.

Month	(Total Housing F(116)	-	Group Quarters F(107)	-	Temporary Mobile Home F(117))	x	Percent Who Will Live in City (SF_2)	=	Permanent Housing In City	+	Temporary Mobile Homes (if in city) F(117)	=	Total City Units
6	(	-		-	)	x		=		+		=	
12	(	-		-	)	x		=		+		=	
18	(	-		-	)	x		=		+		=	
24	(	-		-	)	x		=		+		=	
30	(	-		-	)	x		=		+		=	
36	(	-		-	)	x		=		+		=	
42	(	-		-	)	x		=		+		=	

FORMULA #119
HOUSING IN REMAINDER OF COMMUNITY

Housing not located in the city will be in the remainder of the community. This includes the group quarters and possibly temporary mobile home part, at the construction site.

Total Housing Demand - Total City Units = Housing in Remainder of Community
F(116)   F(118)

Month

6 ________________ - ________________ = ________________

12 ________________ - ________________ = ________________

18 ________________ - ________________ = ________________

24 ________________ - ________________ = ________________

30 ________________ - ________________ = ________________

36 ________________ - ________________ = ________________

42 ________________ - ________________ = ________________

FORMULA #121
ADDED POPULATION IN CITY

Population added to the city by construction is calculated by applying average household size to the number of housing units in the city.

Month	Housing in City F(118)		Average Household Size (Exhibit VI)		Added Population in City
6	__________	x	2.6	=	__________
12	__________	x	2.9	=	__________
18	__________	x	2.9	=	__________
24	__________	x	3.0	=	__________
30	__________	x	3.2	=	__________
36	__________	x	3.2	=	__________
42	__________	x	3.3	=	__________
			Aggregation (Σ)	=	__________

FORMULA #122
ADDED POPULATION IN REMAINDER OF COMMUNITY

The population not living in the city is projected to live in the remainder of the community.

Month	Total New Population F(112)		Added Population in City F(121)		Added Population in Remainder of Community
6		-		=	
12		-		=	
18		-		=	
24		-		=	
30		-		=	
36		-		=	
42		-		=	

FORMULA #123
TOTAL POPULATION IN CITY

Adding the new population generated by construction to the existing population will provide the projected total population in the city.

Added Population in City F(121) + Existing Population City F(11) = Total Population in City

Month

6 ____________ + ____________ = ____________

12 ____________ + ____________ = ____________

18 ____________ + ____________ = ____________

24 ____________ + ____________ = ____________

30 ____________ + ____________ = ____________

36 ____________ + ____________ = ____________

42 ____________ + ____________ = ____________

FORMULA #124
TOTAL POPULATION IN REMAINDER OF COMMUNITY

Population in the remainder of the community is projected by adding new population to existing population.

Month	Added Population in Remainder of Community F(122)		Existing Population in Remainder of Community F(11)		Total Population in Remainder of Community
6		+		=	
12		+		=	
18		+		=	
24		+		=	
30		+		=	
36		+		=	
42		+		=	

FORMULA #125
TOTAL POPULATION IN COMMUNITY

The total population in the community at the six-month intervals is projected by adding total population in the city to total population in the remainder of the community.

Total Population in City F(123) + Remainder of Community F(124) = Total Population in Community

Month

6 ____________ + ____________ = ____________

12 ____________ + ____________ = ____________

18 ____________ + ____________ = ____________

24 ____________ + ____________ = ____________

30 ____________ + ____________ = ____________

36 ____________ + ____________ = ____________

42 ____________ + ____________ = ____________

FORMULA #126
ADDED PUPILS IN ELEMENTARY SCHOOL

The children of construction workers projected to attend elementary schools for the community as a whole is calculated at a standard rate for each added family.

Month	(Married Workers With Dependents F(109)	+	New Nonbase Employees) F(110)	x	Elementary Pupils Per Family (Exhibit VI)	=	Added Pupils in Elementary School
6	(	+	)	x	1.01	=	
12	(	+	)	x	1.01	=	
18	(	+	)	x	1.01	=	
24	(	+	)	x	1.01	=	
30	(	+	)	x	1.01	=	
36	(	+	)	x	1.01	=	
42	(	+	)	x	1.01	=	

Aggregation (Σ) = ____________

FORMULA #127
ADDED PUPILS IN HIGH SCHOOL

The number of pupils added to the high schools is calculated at a standard rate for each added family.

Month	(Married Workers With Dependents F(109)	+	New Nonbase Employees) F(110)	x	High School Pupils Per Family (Exhibit VI)	=	Added Pupils in High School
6	(	+	)	x	.34	=	
12	(	+	)	x	.34	=	
18	(	+	)	x	.34	=	
24	(	+	)	x	.34	=	
30	(	+	)	x	.34	=	
36	(	+	)	x	.34	=	
42	(	+	)	x	.34	=	

Aggregation (Σ) = ______________

FORMULA # 128
ADDED RETAIL SALES

Retail sales to construction workers are at a much lower rate than to permanent residents. Retail sales per employee are estimated at a capture rate one-half that of the steady state. The major impact will be increased sales for existing businesses, as few new retail businesses will be created during the construction phase.

New Retail Sales F(15) ÷ New Steady State Employment F(7) X Total New Employment F(111) ÷ 4 = Added Retail Sales

Month

6 ________ ÷ ________ x ________ ÷ 4 = ________
12 ________ ÷ ________ x ________ ÷ 4 = ________
18 ________ ÷ ________ x ________ ÷ 4 = ________
24 ________ ÷ ________ x ________ ÷ 4 = ________
30 ________ ÷ ________ x ________ ÷ 4 = ________
36 ________ ÷ ________ x ________ ÷ 4 = ________
42 ________ ÷ ________ x ________ ÷ 4 = ________

Aggregation (Σ) = ________

FORMULA #129
TEMPORARY ROAD CONSTRUCTION COST

Roads from existing roads to the coal facility and from town to facility road have already been considered in Formula 27 . Additional roads for the construction phase can only be determined by affected road agencies. The county or city may have to provide temporary roads to the temporary mobile home park(s).

State Highway Needs (State Estimate) = ________________________________

County Road Needs (County Estimate) = ________________________________

City Street Needs (City Estimate) = __________________________________

FORMULA #130
TEMPORARY WATER SYSTEM COST

If the increased water system projected to serve permanent housing is provided as that housing is built, the only temporary water system required will be to serve the temporary mobile home park(s). This cost is related directly to distance from the park to an existing water line, and can only be estimated by the city water agency.

Temporary Water System (City Estimate) = ____________________

FORMULA #131
TEMPORARY SEWAGE DISPOSAL SYSTEM COST

Construction of the permanent sewage treatment plant with capacity to serve the permanent population is unlikely to be completed during the construction phase. Temporary sewage treatment plants will therefore likely be required. This formula calculates the cost of temporary use (construct or lease) based on the number of units to be served, which include all units in the city, all temporary mobile home sites, and group quarters. The figure for cost per housing unit served should be obtained from a local contractor or the State Department of Health or Environmental Protection.

Month	(Permanent Housing in City F(118)	+	Temporary Mobile Home (if at plant site) F(117)	+	Group Quarters F(107))	x	Cost Per Unit	=	Temporary Sewage System Cost
6	(	+		+	)	x		=	
12	(	+		+	)	x		=	
18	(	+		+	)	x		=	
24	(	+		+	)	x		=	
30	(	+		+	)	x		=	
36	(	+		+	)	x		=	
42	(	+		+	)	x		=	

Aggregate (Σ) = ______________

FORMULA #132
TEMPORARY UTILITY COSTS

The major need for temporary utilities during the construction phase is two areas:

- Electricity to the construction site(s) until the coal utilization facility is operating and generating its own power.
- Electricity and telephone to the group quarters and temporary mobile home park(s).

No temporary natural gas service is contemplated. Costs must be estimated by the appropriate utility.

Temporary Electric Service (Utility Estimate) = ______________________

Temporary Telephone Service (Utility Estimate) = ______________________

FORMULA #133
TEMPORARY HOUSING COST

The cost of all permanent housing is calculated in Formulae 33 - 37 . The temporary housing cost for the construction phase will be for temporary mobile home sites only. Group quarters are provided by the construction contractor and costs are not calculated. Temporary mobile homes are provided by occupants and costs are not calculated. The cost per site should be obtained from a contractor or the county assessor's office.

Temporary Mobile Home Sites F(117) x Cost Per Site = Temporary Housing Cost

Month

6 ______________ x ______________ = ______________

12 ______________ x ______________ = ______________

18 ______________ x ______________ = ______________

24 ______________ x ______________ = ______________

30 ______________ x ______________ = ______________

36 ______________ x ______________ = ______________

42 ______________ x ______________ = ______________

FORMULA #134
TEMPORARY ELEMENTARY SCHOOL NEEDS

Permanent schools to serve the added school children are unlikely to be ready during the construction phase. Available vacant classrooms will be used to the extent possible. Temporary facilities will likely be required the remaining temporary demand.

Month	Added Pupils in Elementary School F(126)		Pupils Per Class F(37)		Total Rooms Needed		Available Rooms F(37)		Net Temporary Elementary Rooms
6		÷		=		-		=	
12		÷		=		-		=	
18		÷		=		-		=	
24		÷		=		-		=	
30		÷		=		-		=	
36		÷		=		-		=	
42		÷		=		-		=	

Aggregation (Σ) = ________________

FORMULA #135
TEMPORARY HIGH SCHOOL NEEDS

Temporary facilities will also be needed for temporary high school pupils calculated in the same manner as for elementary pupils.

Month	Added Pupils in High School F(127)		Pupils Per Class F(38)		Total Rooms Needed		Available Rooms F(38)		Net Temporary High School Rooms
6		÷		=		-		=	
12		÷		=		-		=	
18		÷		=		-		=	
24		÷		=		-		=	
30		÷		=		-		=	
36		÷		=		-		=	
42		÷		=		-		=	

Aggregation - (Σ) = ____________

FORMULA # 136
ADDED CITY EXPENDITURES

The impact of the construction period on city services will be intense and uneven. The provision of police, fire, street, park, recreation and library services will tend to lag behind need and be subject to overutilization. Traffic, water and sewage disposal costs will rise rapidly due to overcrowding and use of temporary facilities. Pressures on the planning, engineering and building inspection services will be heavy. For purposes of this analysis, it may be assumed that city expenditures will be at 80% of the per capita level projected under the steady state condition.

$$\frac{\text{Aggregate Added Population in City}}{F(121)} \div 2 \times \frac{\text{Total City Expenditure}}{F(65)} \div \frac{\text{Total Population in City}}{F(11)} \times .80 =$$

Added City Expenditures During the 42 Month Construction Period

____________ ÷ 2 x ____________ ÷ ____________ x .80 = ______________

FORMULA # 137
ADDED COUNTY EXPENDITURES

County expenditures are more directly related to the number of people than city expenditures, and less lag is experienced in providing service. For this analysis, therefore, added costs during the construction phase are projected at 90% of the per capita expenditure projected for the steady state.

$$\frac{\text{Aggregate Total New Population in Community}}{F(112)} \div 2 \times \frac{\text{Total County Expenditure}}{F(71)}$$

$$\div \frac{\text{Total Population}}{F(11)} \times .90 = \underline{\text{Added County Expenditures During the 42 Month Construction Period}}$$

$$\underline{\qquad\qquad} \div 2 \quad \times \underline{\qquad\qquad} \div \underline{\qquad\qquad} \quad \times .90 = \underline{\qquad\qquad\qquad}$$

FORMULA #138
ADDED ELEMENTARY SCHOOL EXPENDITURES

The added cost of elementary schools during the construction phase includes the provision of temporary classrooms and hiring of temporary teachers. The monthly rental cost figure should be obtained from the State Department of Education.

Σ Net Temporary Elementary Rooms F(134) x 6 x Monthly Rental Cost = Added Room Rental Cost

______________ x 6 x ______________ = ______________

Σ Added Pupils in Elementary School F(126) ÷ 2 x Cost Per Student F(72) = Added Operating Cost for Elementary Schools

______________ ÷ 2 x ______________ = ______________

Added Room Rental Cost + Added Operating Cost for Elementary Schools = Total Added Elementary School Costs

______________ + ______________ = ______________

FORMULA #139
ADDED HIGH SCHOOL EXPENDITURES

The added cost of high schools during the construction phase includes the provision of temporary classrooms and hiring of temporary teachers. The monthly rental cost figure should be obtained from the State Department of Education.

$$\frac{\Sigma \text{ Net Temporary High School Rooms}}{F(135)} \times 6 \times \underline{\text{Monthly Rental Cost}} = \underline{\text{Added Room Rental Cost}}$$

________ x 6 x ________ = ________

$$\frac{\Sigma \text{ Added Pupils in High School}}{F(127)} \div 2 \times \frac{\text{Cost Per Student}}{F(73)} = \underline{\text{Added Operating Cost for High Schools}}$$

________ ÷ 2 x ________ = ________

$$\underline{\text{Added Room Rental Cost}} + \underline{\text{Added Operating Cost for High Schools}} = \underline{\text{Total Added High School Costs}}$$

________ + ________ = ________

FORMULA # 140
ADDED CITY PROPERTY TAXES

Property taxes paid to the city will lag behind the construction of housing or facilities because of time required to assess property, place it on the tax rolls and collect taxes. Taxes from construction related activities will therefore be received from one to two years after construction begins. Twenty-five percent of permanent housing should be complete in the third year of construction.

Added Assessed Valuation in City	X .25 X	State Ratio of Assessed Value to Market Value	X	City Property Tax Rate	=	City Property Tax During Construction
F (53)		F (52)		F (80)		

____________ x .25 x ________________ x ______________ = ______________

FORMULA #141
ADDED SALES TAXES

During the construction phase, the concentration of retail sales will be in the city as the commercial center of the community. Added sales taxes are calculated by multiplying added retail sales by the city sales tax rate.

Σ Added Retail Sales	x	Sales Tax Rate	=	Added Sales Tax During Construction
F (128)		F (81)		
	x		=	

FORMULA #142
OTHER CITY REVENUES

Operating revenues to the city other than property and sales taxes can be projected on a per capita basis. Here again, revenues will lag because of the need to take census of population and certify results to the state for subventions.

$$\left[\left(\underset{\text{F (93)}}{\underline{\text{Total Municipal Revenues}}} - \underset{\text{F (80)}}{\underline{\text{Property Taxes}}} - \underset{\text{F (81)}}{\underline{\text{Sales Tax}}}\right) \div \underset{\text{F (11)}}{\underline{\text{Total City Population}}}\right] \times \left(\underset{\text{F (121)}}{\underline{\text{Added Population in City - Month 6}}} + \underset{\text{F (121)}}{\underline{\text{Added Population in City - Month 18}}}\right) = \underline{\text{Other City Revenues}}$$

$$\left[\left(\underline{\hspace{2cm}} - \underline{\hspace{2cm}} - \underline{\hspace{2cm}}\right) \div \underline{\hspace{2cm}}\right] \times \left(\underline{\hspace{2cm}} + \underline{\hspace{2cm}}\right)$$

$$= \underline{\hspace{2cm}}$$

FORMULA #143
ADDED COUNTY PROPERTY TAXES

Property taxes paid to the county will lag behind the construction of housing or facilities because of time required to assess property, place it on the tax rolls and collect taxes. Taxes from construction related activities will therefore be received from one to two years after construction begins. Twenty-five percent of permanent housing should be complete in the third year of construction.

Added Assessed Valuation in Community	x .25 x	State Ratio of Assessed Value to Market Value	x	County Property Tax Rate	=	Added County Property Taxes During Construction
F (53)		F (52)		F (94)		

_____________ x .25 x __________________ x _______________ = ______________

FORMULA #144
OTHER COUNTY REVENUES

Operating revenues to the county other than property taxes can be projected on a per capita basis. As with city revenues receipt of money will lag, so that, for example, the population at Month 6 will be the basis for second year revenues and the population at Month 18 the basis of third year revenues. By the fourth year after start, the steady state projections apply.

$$\left(\underset{\text{F (106)}}{\underline{\text{County Revenues}}} - \underset{\text{F (94)}}{\underline{\text{Property Taxes}}}\right) \div \underset{\text{F (11)}}{\underline{\text{Total Population in Community}}} \times \left(\underset{\text{F (112)}}{\underline{\text{Added Population in Community - Month 6}}} + \underset{\text{(F112)}}{\underline{\text{Added Population in Community - Month 18}}}\right) = \underline{\text{Other County Revenues}}$$

(________ - ________) ÷ ________ x (________ + ________) = __________

FORMULA #145
ADDED SCHOOL PROPERTY TAXES

Property taxes for school operations are based on the assessed valuation of the entire community timex the average countywide school property tax rate. Revenues lag behind population in the same manner as county property taxes do.

F (145A)	Added Assessed Valuation in Community	x .25 x	Countywide Average Elementary School Property Tax Rate	=	Elementary Property Taxes During Construction
	F (53)		F (78)		
	______________	x	______________	=	______________
F (145B)	Added Assessed Valuation in Community	x .25 x	Countywide Average High School Property Tax Rate	=	High School Property Taxes During Construction
	F (53)		F (78)		
	______________	x	______________	=	______________

FORMULA #146
ADDED STATE EQUALIZATION - ELEMENTARY

The state may give aid to school districts which have an assessed valuation per pupil lower than a level which the state determines is required for basic school support. The following formulae are required to calculate the state equalization support, as if the entire county were one elementary school district, during the construction phase. The existing total elementary state equalization figure should be obtained from the Department of Education.

F(146A)

$$\frac{\text{State Support Factor (Elementary)}}{F\ (75)} \times \left(\frac{\text{Base Level of Assessed Valuation}}{F\ (75)} - \left[\frac{\text{Existing Assessed Valuation in Community}}{F\ (54)} \div \left(\frac{\text{Current Elem. Students}}{F\ (37)} + \frac{\text{Added Pupils Month 6}}{F\ (126)} \right) \right] \right) - \underline{\text{Existing Total Elementary State Equalization}} = \underline{\text{State Equalization \#1}}$$

$$\underline{\qquad\quad} \times \left(\underline{\qquad\quad} - \left[\underline{\qquad\quad} \div \left(\underline{\qquad\quad} + \underline{\qquad\quad} \right) \right] \right) - \underline{\qquad\quad} = \underline{\qquad\quad}$$

F(146B)

$$\frac{\text{State Support Factor (Elementary)}}{F\ (75)} \times \left(\frac{\text{Base Level of Assessed Valuation}}{F\ (75)} - \left[\left(\left(\frac{\text{Existing Assessed Valuation of District}}{F\ (54)} + \frac{\text{Added Assessed Valuation in Community}}{F\ (53)} \right) \div 3 \right) \div \left(\frac{\text{Current Elem Students}}{F\ (37)} + \frac{\text{Added Pupils Month 18}}{F\ (126)} \right) \right] \right) - \underline{\text{Existing Total Elementary State Equalization}} = \underline{\text{State Equalization \#2}}$$

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FORMULA # 146 (Continued)

$$\underline{\qquad\qquad} \times \left(\underline{\qquad\qquad} - \left[\left(\underline{\qquad\qquad} + \left| \underline{\qquad\qquad} \div 3 \right] \right) \div \left(\underline{\qquad\qquad} + \underline{\qquad\qquad} \right) \right] \right) -$$

$$\underline{\qquad\qquad} = \underline{\qquad\qquad}$$

F(146C)

$$\frac{\text{State Support Factor (Elementary)}}{\text{F (76)}} \times \left(\frac{\text{Base Level of Assessed Valuation}}{\text{F (75)}} - \left[\left(\frac{\text{Existing Assessed Valuation of District}}{\text{F (54)}} + \left| \frac{\text{Added Assessed Valuation in Community}}{\text{F (53)}} \times \frac{2}{3} \right] \right) \div \left(\frac{\text{Current Elem. Students}}{\text{F (37)}} + \frac{\text{Added Pupils Month 30}}{\text{F (126)}} \right) \right] \right) - \underline{\text{Existing Total Elementary State Equalization}} = \underline{\text{State Equalization \#3}}$$

$$\underline{\qquad\qquad} \times \left(\underline{\qquad\qquad} - \left[\left(\underline{\qquad\qquad} + \left| \underline{\qquad\qquad} \times \frac{2}{3} \right] \right) \div \left(\underline{\qquad\qquad} + \underline{\qquad\qquad} \right) \right] \right) -$$

$$\underline{\qquad\qquad} = \underline{\qquad\qquad}$$

F(146D)

$$\underline{\text{State Equalization \#1}} + \underline{\text{State Equalization \#2}} + \underline{\text{State Equalization \#3}} = \underline{\text{Added State Equalization}}$$

$$\underline{\qquad\qquad\qquad} + \underline{\qquad\qquad\qquad} + \underline{\qquad\qquad\qquad} = \underline{\qquad\qquad\qquad\qquad}$$

Note: If there is no deficiency of assessed valuation, i.e., if actual level exceeds base level, there will be no state equalization support.

FORMULA #147

STATE EQUALIZATION - HIGH SCHOOL

The state may give aid to school districts which have an assessed valuation per pupil lower than a level which the state determines is required for basic school support. The following formulae are required to calculate the state equalization support, as if the entire county were one school district, during the construction phase. The existing total high school state equalization figure should be obtained from the Department of Education.

F(147A)

$$\frac{\text{State Support Factor (High School)}}{\text{F (75)}} \times \left(\frac{\text{Base Level of Assessed Valuation}}{\text{F (75)}} - \left[\frac{\text{Existing Assessed Valuation of District}}{\text{F (54)}} \div \left(\frac{\text{Existing Pupils}}{\text{F (38)}} + \frac{\text{Added Pupils Month 6}}{\text{F (127)}} \right) \right] \right) - \underline{\text{Existing Total H. S. State Equalization}} = \underline{\text{State Equalization \#1}}$$

$$\underline{\hspace{2cm}} \times \left(\underline{\hspace{2cm}} - \left[\underline{\hspace{2cm}} \div \left(\underline{\hspace{2cm}} + \underline{\hspace{2cm}} \right) \right] \right) - \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$

F(147B)

$$\frac{\text{State Support Factor (High School)}}{\text{F (75)}} \times \left(\frac{\text{Base Level of Assessed Valuation}}{\text{F (75)}} - \left[\left(\frac{\text{Existing Assessed Valuation of District}}{\text{F(54)}} + \frac{\text{Added Assessed Valuation in Community}}{\text{F (53)}} \div 3 \right) \div \left(\frac{\text{Existing Pupils}}{\text{F (38)}} + \frac{\text{Added Pupils Month 18}}{\text{F (127)}} \right) \right] \right) - \underline{\text{Existing Total H. S. State Equalization}} = \underline{\text{State Equalization \#2}}$$

FORMULA #147 (Continued)

$$\underline{\qquad\quad} \times \left(\underline{\qquad\quad} - \left[\left(\underline{\qquad\quad} + \left|\underline{\qquad\quad} \div 3\right|\right) \div \left(\underline{\qquad\quad} + \underline{\qquad\quad}\right)\right]\right) -$$

$$\underline{\qquad\quad} = \underline{\qquad\quad}$$

$$\text{F(147C)}\quad \frac{\text{State Support Factor (High School)}}{\text{F (75)}} \times \left(\frac{\text{Base Level of Assessed Valuation}}{\text{F (75)}} \times \left[\left(\frac{\text{Existing Assessed Valuation of District}}{\text{F (54)}} + \left|\frac{\text{Added Assessed Valuation in Community}}{\text{F (53)}} \times \frac{2}{3}\right|\right) \div \left(\frac{\text{Existing Pupils}}{\text{F (38)}} + \frac{\text{Added Pupils Month 30}}{\text{F (127)}}\right)\right]\right) - \underline{\text{Existing Total Elem. State Equalization}} = \underline{\text{State Equalization \#3}}$$

$$\underline{\qquad\quad} \times \left(\underline{\qquad\quad} - \left[\left(\underline{\qquad\quad} + \left|\underline{\qquad\quad} \times \frac{2}{3}\right|\right) \div \left(\underline{\qquad\quad} + \underline{\qquad\quad}\right)\right]\right) -$$

$$\underline{\qquad\quad} = \underline{\qquad\quad}$$

$$\text{F(147D)}\quad \underline{\text{State Equalization \#1}} + \underline{\text{State Equalization \#2}} + \underline{\text{State Equalization \#3}} = \underline{\text{Added State Equalization}}$$

$$\underline{\qquad\qquad} + \underline{\qquad\qquad} + \underline{\qquad\qquad} = \underline{\qquad\qquad\qquad}$$

Note: If there is no deficiency of assessed valuation, i.e., if actual level exceeds base level, there will be no state equalization support.

FORMULA #148
OTHER SCHOOL AID

State aid is given to elementary and high school districts for a variety of purposes (see Formulae 74, 76 and 77). These can be estimated on a per capita basis for the pupils added to each school system.

F(148A) $$\left(\underset{F(126)}{\underline{\text{Σ Added Pupils in Elementary School}}} \div 2\right) \times \left(\underset{F\ (74)}{\underline{\text{State Allocation}}} + \underset{F\ (76)}{\underline{\text{Average Per Pupil Aid}}} + \underset{F\ (77)}{\underline{\text{Per Pupil Federal Allocation}}}\right)$$

$$= \underline{\text{Added Other School Aid (Elem)}}$$

$$\left(\underline{\qquad\qquad} \div 2\right) \times \left(\underline{\qquad\qquad} + \underline{\qquad\qquad} + \underline{\qquad\qquad}\right) = \underline{\qquad\qquad}$$

F(148B) $$\left(\underset{F(127)}{\underline{\text{Σ Added Pupils in High School}}} \div 2\right) \times \left(\underset{F\ (74)}{\underline{\text{State Allocation}}} + \underset{F\ (76)}{\underline{\text{Average Per Pupil Aid}}} + \underset{F\ (77)}{\underline{\text{Per Pupil Federal Allocation}}}\right)$$

$$= \underline{\text{Added Other School Aid (H. S.)}}$$

$$\left(\underline{\qquad\qquad} \div 2\right) \times \left(\underline{\qquad\qquad} + \underline{\qquad\qquad} + \underline{\qquad\qquad}\right) = \underline{\qquad\qquad}$$

IX. COST-REVENUE ANALYSIS

The purpose of the entire procedures manual is to provide for for the preparation of a comprehensive, generalized cost-revenue analysis of the socioeconomic impacts of coal gasification plants on the communities in which they locate. This analysis will be designed to aggregate the costs and revenues for the community governmental structure.

1. SOCIOECONOMIC IMPACTS ARE GENERATED BY CHANGES IN EMPLOYMENT, POPULATION AND HOUSING

- Three years of plant construction and mine start up. This period will have a rapid build-up of temporary construction workers, with a need for housing and services unavailable in the local community. Over the last six months of construction this work force will decline and start-up operations will begin.
- Twenty-five years of plant operation, based on the projected life of the plant. Once in operation, the work force and flow of dollars will be relatively constant.
- Two years of shutdown and termination. At the end of the useful life of the plant, gasification will cease and the plant will be closed, dismantled or altered for a new use. In this phase, the work force will decline to zero and the community will not need to provide services, though the housing and facilities may remain.

The changes in employment, population, and housing for the community should be summarized at this point in Table 1.

2. THE COST-REVENUE ANALYSIS IS ORIENTED TO LOCAL GOVERNMENT

The major impact of the construction and operation of coal utilization facilities will be on the local governments of the community-county, city and school districts(s). It is these agencies which will be expected to provide the major portion of the infrastructure and public facilities in the construction phase and provide public services throughout the life of the facility.

The three forms of local government are tied together by a common reliance on the property tax for revenue. An excessive demand by one will affect the resources of the others. Most other revenues and responsibilities are quite distinct so that the cost-revenue analysis must treat them separately.

(1) Costs Are Likely to Exceed Revenues in the Short Run

During the construction phase for the new coal utilization facility, great demands will be placed on the local governments to provide both capital projects and governmental services. Capital projects requiring massive amounts of money

TABLE 1
PHASING OF COMMUNITY IMPACTS

Employment	Existing Base	Additions to Base Months After Start of Construction							Steady State Total
		6	12	18	24	30	36	42	
Base Employment	F(1)	Exhibit VII							F(1)
Nonbase Employment	F(2)	F(110)							F(2)
Employment-Total	F(4)	F(111)							F(4)
Population-Total	F(11)	F(112)							F(11)
Households	F(9)	F(111)							F(9)
Housing									
Single Family	F(23)	F(113)							F(23)
Multi-Family	F(23)	F(114)							F(23)
Mobile Home-Perm.	F(23)	F(22)							F(23)
Mobile Home-Temp.	N.A.	F(117)							N.A.
Group Quarters	N.A.	F(107)							N.A.
Housing Total	F(23)	F(116)							F(23)

which will not be available as tax revenues come in on an annual basis. Even those revenues will lag far behind the influx of population as it takes time to assess property and collect taxes or take the census to qualify for increased state subventions.

The higher cost may be impossible to quantify. Great time and financial pressures will be placed on local governments to anticipate, plan for and review an unprecedented growth. Staffing levels and working schedules adequate today will be overwhelmed. The resulting overwork, overcrowding, and delays will likely lead to declines in the level and quality of public service during the construction phase.

(2) Revenues May Exceed Costs During the Steady State Period

Following the construction phase, the pressures will decline, assuming no additional facilities are immediately planned. The temporary construction force will be gone, resulting in lower demands for housing and schools. The permanent infrastructure and public facilities may be in place allowing the resumption of or increase in the previous level of service.

During the steady state, revenues will be received by local governments on a regular, predictable basis. The community as a whole may benefit from the assessed valuation and tax payments of the cost utilization facility to pay for public services.

(3) The Cost-Revenue Ratio in the Steady State is Critical

The critical question of the cost-revenue analysis for local government is:

- Will the revenues in the steady state exceed the costs in the steady state by a sufficient margin to cover the negative balance during the construction phase?

This procedures manual will allow the answering of that question for the local governments of the community being studied.

(4) Assumptions of the Analysis Affect the Results

In order to provide a consistency among the various community local government cost-revenue analyses, the following assumptions are made:

- Permanent capital improvements to serve the steady state population are capitalized, i.e., assumed to be financed by long term bonds--25 years at 7% interest rate. This interest rate will vary with the bond market but in general be higher than average due to communities'lack of track record and large amount of new debt. Final determination of interest rate to be used should be made by the researcher.

- Capital needs for the temporary construction force are provided out of annual operating budgets

- Current property tax rates are used for the analysis; no changes in revenue rates are shown. The purpose of the cost-revenue analysis is to identify in imbalances rather than provide the means to correct them.

- To determine the aggregate costs and revenues, a discounted present value approach is used, based on Office of Management and Budget indicators of the social cost of capital (discount rate).

FORMULA #150

CITY SUMMARY-CONSTRUCTION PHASE

ADDED COSTS	Source	Amount
City Streets	F(129)	
Temporary Water System	F(130)	
Temporary Sewage System-Aggregate (Σ)	F(131)	
Subtotal		
Added City Expenditures	F(136)	
Total Costs		

ADDED REVENUES		
City Property Taxes	F(140)	
Added Sales Taxes	F(141)	
Other City Revenues	F(142)	
Total Revenues		

FORMULA #151
COUNTY SUMMARY-CONSTRUCTION PHASE

ADDED COSTS	Source	Amount
County Roads	F(129)	
County Expenditures	F(137)	
Total Costs		
ADDED REVENUES		
County Property Taxes	F(143)	
Other County Revenues	F(144)	
Total Revenues		

FORMULA #152
SCHOOL SUMMARY-CONSTRUCTION PHASE

	Elementary	High School	Total
ADDED COSTS			
Temporary Room Cost	__________F(138)	__________F(139)	__________
Operating Expenditure	__________F(138)	__________F(139)	__________
Total	__________F(138)	__________F(139)	__________
ADDED REVENUES			
Property Taxes	__________F(145)	__________F(145)	__________
State Equalization	__________F(146)	__________F(147)	
Other School Aid	__________F(148)	__________F(148)	__________
Total	__________	__________	__________

FORMULA #153
CITY-CAPITAL IMPROVEMENTS
(STEADY STATE)

Item	Code	Source	Amount
City Streets	FRC_4	F(28)	
Water System	FWC	F(29)	
Sewage Disposal	FDC	F(30)	
Fire Station/Equipment	FFC	F(41)	
Police Station	FPC_1	F(42)	
Library	FLC	F(44)	
Government Offices	FGC_2	F(45)	
Parks	FPC_2	F(46)	
Subtotal			
Minus projected capital grants (1/2 FDC, 1/2 FPC_2)			
Total Capital Cost to City			

Total Capital Cost x .0858[1] = Annual Capital Cost

____________ x .0858 = ____________

---

[1] Assumes 25-year financing at 7% interest rate.

FORMULA #154
COUNTY-CAPITAL IMPROVEMENTS
(STEADY STATE)

Item	Code	Source	Amount
County Roads	FRC_3	F(27)	
Hospital	FMC_1	F(39)	
Health Clinics	FMC_2	F(40)	
Criminal Justice	FJC	F(43)	
Government Offices	FGC_1	F(45)	
Total Cost			

Total Cost x .0858[1] = Annual Cost

__________ x .0858 = __________

---

[1] Assumes 25-year financing at 7% interest rate.

FORMULA #155
SCHOOL-CAPITAL IMPROVEMENTS
(STEADY STATE)

Item	Code	Source	Amount
Elementary School	FSC_1	F(37)	
High School	FSC_2	F(38)	
Total			

Total Cost x .0858[1] = Annual Cost

__________ x .0858 = __________

---

[1] Assumes 25-year financing at 7% interest rate.

FORMULA #156
CITY SUMMARY, COST-REVENUE

CONSTRUCTION PHASE

Total Costs ________________ F(150)

Total Revenues ________________ F(150)

Surplus (Deficit) ________________

STEADY STATE

Annual Capital Cost ________________ F(153)

Plus Annual Operations ________________ (F65)

Annual Total ________________

Annual Revenues ________________ (F93)

Surplus (Deficit) ________________

PRESENT VALUE[1]

Construction Phase Surplus (Deficit) ____________ x 2.49 = ________________

Steady State Surplus (Deficit) ________________ x 6.82 = ________________

Combined Present Value ________________

---

[1] Assumed at 10% per OMB.

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FORMULA #157
COUNTY SUMMARY, COST-REVENUE

CONSTRUCTION PHASE

Added Costs ________ F(151)

Added Revenues ________ F(151)

Surplus (Deficit) ________

STEADY STATE

Annual Capital Cost ________ F (154)

Plus Annual Operations ________ F (71)

Annual Total Costs ________

Annual Revenues ________ F (106)

Surplus (Deficit) ________

PRESENT VALUE[1]

Construction Phase Surplus (Deficit) ________ x 2.49 = ________

Steady State Surplus (Deficit) ________ x 6.82 = ________

Combined Present Value ________

---

[1] Assumed at 10% per OMB.

FORMULA #158
SCHOOL SUMMARY, COST-REVENUE

CONSTRUCTION PHASE

Added Costs ______________ F (152)

Added Revenues ______________ F (152)

Surplus (Deficit) ______________

STEADY STATE

Annual Capital Cost ______________ F (155)

Plus Annual Operations ______________ F (72) and F (73)

Annual Total Costs ______________

Annual Revenues ______________ F (79)

Surplus (Deficit) ______________

PRESENT VALUE[1]

Construction Phase Surplus (Deficit) ____________ x 2.49 = ______________

Steady State Surplus (Deficit) ______________ x 6.82 = ______________

Combined Present Value ______________

---

[1] Assumed at 10% per OMB.

FORMULA #159
LOCAL GOVERNMENT
SUMMARY OF PRESENT VALUE

	Construction Phase	Steady State	Total
City F(156)			
County F(157)			
School F(158)			
Total			

X. IMPACTS ON THE COMMUNITY

The quantitative impacts of cost utilization facilities on the local community shown in the preceding chapters are critical to determining the costs and benefits to the local community. These are not the only impacts, however, for significant changes may occur in:

- Population characteristics
- Community quality of life
- Existing economic base

The areas covered in this chapter are commented on by the research, but only in qualitative terms. Most of the items cannot be quantified, but the direction of impact and general level can be indicated. Each of these areas may be portrayed as one of the following, in relation to the impact on the local community:

- Very favorable
- Favorable
- Little impact
- Unfavorable
- Very unfavorable

A summary of these impacts can be shown in Exhibit VIII at the end of this chapter. To assist in preparing these qualitative assessments, descriptive comments for each of the five degrees of impact are presented following each section of this chapter.

1. COMMUNITY POPULATION WILL BLEND EXISTING AND NEW CHARACTERISTICS

The precise characteristics of the community population during the construction and steady state periods are difficult to project, because of the following factors:

- Census information on the existing population may be incomplete or outdated.
- Data will likely not be available for the city/urbanized area.
- Little is known on the characteristics of the incoming work force, especially the permanent operating force.
- The impact of local hiring is unknown.

Nevertheless, by utilizing information gathered or developed in this manual, it is possible to project, in very general terms, several key characteristics of the population. The methods shown here apply to the steady state period only for during construction the population characteristics will change continuously.

(1) Average Household Size Is Easily Calculated

The total population in the community divided by the total number of households gives average household size. Formula 11 may be used to make this calculation.

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Increases in household size could be costly by adding to school costs.

Very Favorable	Reduction of more than .25 per household
Favorable	Reduction of up to .25 per household
Little Impact	No change in household size
Unfavorable	Increase of up to .25 per household
Very Unfavorable	Increase of more than .25 per household

(2) Education And Skill Levels Can Be Estimated Only Relatively From Data In This Manual

While data is available from the Census on the overall education and general employment (skill) categories for the existing population, little information is likely to be available at this time on the potential employees of the coal utilization facilities.

Generally, the requirements of coal processing facilities will be higher than those of mines, while both will be higher than for agricultural industry which is the existing economic base for most local communities under study.

Very Favorable	Existing industry mostly agriculture
Favorable	Existing industry mixed
Little Impact	Existing industry mostly natural resource utilization
Unfavorable	Existing education level over 12 years
Very Unfavorable	--

(3) Income levels Are Likely To Rise Significantly

The technical nature of the work tasks and the need to compete on a wide scale for employees assure that the average wages for coal utilization employees will be high, and more likely than not to exceed the average wages for existing industry.

Projected mean wages for coal utilization employees is obtained from the applicant companies (Exhibit IB in Chapter IV). The method for calculating potential mean income is shown in Formula 14.

Very Favorable	At least 50% increase in mean
Favorable	At least 25% increase in mean
Little Impact	Less than 10% increase in mean
Unfavorable	No increase in mean income
Very Unfavorable	Decrease in mean income

2. SIGNIFICANT CHANGES WILL LIKELY OCCUR IN THE COMMUNITY QUALITY OF LIFE

With the construction and operation of coal utilization facilities, the life in local communities will never be the same. The impacts will be diverse, varying by phase--construction or steady state--, by size and style of the existing community and by the number and timing of facilities. Benefits and costs will vary by economic sector. Some will be greatly helped, others harmed. New opportunities will open up, but new problems will also be created.

(1) New Employment Opportunities Will Be Created

Local residents will have the chance to obtain construction and operating jobs with the coal utilization facilities. Usually the applicant companies desire to hire locally to the extent possible. (See Exhibit IB, Chapter IV). This can provide the opportunity for those unemployed to find jobs and for those currently employed to find new positions, perhaps with higher incomes.

During the construction phase, especially there should be no lack of job opportunities for local residents on the construction force. In the steady state, not only will there be operating jobs at the coal utilization facility, but also there will be increased employment in the nonbase sector.

On the other hand, competition for jobs can be increased because of:

- Announcement of the plants may attract currently unemployed persons to the community in search of work. This may be especially significant if there is high unemployment elsewhere in the Old West Region.
- Construction workers hired to build the facility may decide to stay on in search of permanent employment.
- Local residents may not have the skills or experience required by the companies.

Very Favorable	Current unemployment of over 8% is reduced
Favorable	Current unemployment 3%-8% is reduced
Little Impact	Unemployment under 3%
Unfavorable	Immigration causes higher unemployment
Very Unfavorable	--

(2) New Shopping Opportunities Will Be Created

Addition of new population and income to the communtiy will create added demand for retail goods and services. The increase in retail sales was projected in Formula 24D.

This increase has generated a demand for additional retail space, as calculated in Formula 47. Creation of this space will likely increase options to shoppers in variety, quality, and price. One effect will be to reduce the current dependence on other larger centers. Shopping can be done in the community which formerly required going outside.

Very Favorable	Retail sales increase over 100%
Favorable	Retail sales increase 50%-100%
Little Impact	Retail sales increase 0%-50%
Unfavorable	--
Very Unfavorable	--

(3) New Housing Will Be Constructed

The potential exists for new housing opportunities for present local residents. New housing units demanded are summarized in Formula 23. With that comes the possibility for newer housing with more choice of size and location.

Experience indicates, however, that for the most part the following impacts are likely to be felt:

- The rapid build-up of the construction force will absorb all current vacancies.
- The intense demand will inflate purchase and rental prices.
- Construction of permanent housing will lag behind demand.
- Inflated demand will reduce the incentives to provide quality housing.
- The housing gap will be met by temporary trailers.
- Temporary trailer parks will have few amenities.

The degree of unfavorable impacts on housing can almost be measured by the degree to which temporary mobile homes have to be used. (See Formula 118).

Very Favorable	Significant new permanent housing constructed
Favorable	Housing demand matches permanent housing supply
Little Impact	Small number of temporary mobile homes
Unfavorable	Large number of temporary mobile homes
Very Unfavorable	Extensive number of temporary mobile homes

(4) Land And Improvement Values Will Increase Because of Demand

For owners of property, the impacts of construction and operation can be favorable. The construction phase will bring intense demand and the steady state a permanent increase in demand for land, commercial buildings and housing. The degree to which values will increase is dependent upon current values, percentage of vacancy, relationship of demand to present supply and a variety of other factors.

This manual calculates the market value assessed valuation for new construction, which also includes land. The presumption is that land used for housing and commercial buildings is more valuable than it was previously. No other calculations are made, nor could be made, on increases in value.

Qualitative estimates may be made by interviews with real estate people in the community.

Very Favorable	City captures over 75% of base employment
Favorable	City captures 25%-75% of employment
Little Impact	Population widely dispersed in rich agriculture area
Unfavorable	Facility and town located on Reservation
Very Unfavorable	--

(5) The Levels And Quality Of Public Services Will Depend On Available Financial Resources

Even without the constraints of financial resources, the quality of public services is likely to decline during the construction phase. The rapid build-up of personnel will place immediate demands on local government for which they are unlikely to have the experience, facilities or staff required for response. There will inevitably be a lag between demand and provision of services. During construction and the early part of the steady state, it will be very difficult to catch up with service needs.

The degree to which public service levels decline during construction will depend on a number of factors, including:

- Present quality of public service
- Present deficiency of staff and facilities
- Planning abilities of community
- Degree of federal, state and company support
- Size of existing community, and ratio to new work force

Very Favorable	--
Favorable	Company support of temporary services
Little Impact	Slow growth, new population is small percentage of existing
Unfavorable	New population is 25%-100% of existing
Very Unfavorable	New population is over 100% of existing

In the steady state phase, the quality of public services is presumed to be adequate for the community. The level of service reflected in per capita expenditures, is projected to be equivalent to cities and communities of the new population level within the state. For example, if the community is projected to grow from 2,000 persons to 10,000 persons, the per capita public expenditures in Chapter VII are projected at the current level of communities in the 10,000 population range within the state. Virtually without exception, larger cities and communities spend more per capita and presumably the quality of service is higher.

For purposes of this analysis, one measurement of the change in quality of public services in the property tax rate.

If the operating budget analysis indicates revenues exceed expenditures at the current tax rate, then services will (or at least have have the potential to) improve. If expenditures exceed revenues, the quality will decline unless there is the necessary increase in the property tax rate.

Very Favorable	Revenues exceed expenditures
Favorable	Revenues and expenditures balance
Little Impact	Existing levels maintained or expenditures exceed revenues
Unfavorable	Significant increase in tax rate required
Very Unfavorable	Impossible to finance capital improvements

3. IMPACTS ON EXISTING INDUSTRIES ARE LIKELY TO BE ADVERSE

Existing basic industries of the area are agriculture, tourism/recreation and natural resource utilization. If required environmental standards are applied, there should be little direct adverse impact from coal utilization on these industries. The major impacts will be indirect, as the new facilities compete with the existing industries for:

- Land

- Water
- People

The type and degree of competition varies by industry.

(1) Agriculture Will Compete For Land, Water And People

A western strip mine large enough to supply a 250 million cu. ft./day gasification facility would have to produce between 9-10 million tons/year of coal (1000 tons/hr.). It is assumed that the reclamation (grading and vegetating) of the spoil areas of the mined land will be an on-going task, occurring concurrently with mining operations. At any given time, it is estimated that the disturbed area will be about 1700 acres. This total is composed of:

	950 acres	of land not having yet been fully reclaimed. Three to four years must be allowed for backfilling, grading, reseeding and reaching full vegetation.
	500 acres	of ungraded disturbed land
	250 acres	of land actively being mined plus haul roads
Total	1700 acres	

The mining operation will progress at a rate of about 375 acres/yr. This is the rate required for an eleven foot coal seam to supply the required feed for the processing plant. Sufficient coal reserves must be guaranteed to supply the plant for at least 20 years. Using conservative coal reserve estimates and aiming at a 30-year plant life (to cover contingencies) the total acreage mined will be in excess of 11,000 acres. As well as the land needed for mining, about 950 to 1,000 acres will be used for the coal gasification plant. The projected amount may have been provided by the company in Exhibit IA.

These figures will vary with several factors, including depth of the coal seam and the rate at which land is reclaimed and returned to original use. The acreage taken each year will relate directly to the depth of the coal seam.

Seam	Annual Acreage
5 feet	825 acres
15	275
20	205
25	165

Acreage can be calculated for other coal seam depths by dividing 4125 by the seam depth with a minimum disturbance of 100 acres per year.

Land that is mined will go out of its current use whether agriculture or grazing. An opportunity cost is associated with the alternate use of any acre mined. The opportunity cost may be measured by multiplying the acres taken, e.g., 1,700 acres per year plus 1,000 for facility site, times the income per acre from agriculture or grazing. The income figures should be obtained from the county agricultural agent.

A second area of competition is for water. In need of the Old West Region the amount of water is limited. A coal gasification plant could use 8,000 to 9,000 acre-feet/year. Agriculture may have prior rights, but the increase in demands may raise the cost of water for agriculture.

Finally, the new facilities will compete for employees. Typically, the average wages for the coal utilization facilities will be much higher than the labor wages for agriculture. Present farm employees may be attracted to the new facilities leaving the farms with the alternatives of becoming less labor intensive, raising wages, or cutting back operations.

Very Favorable	---
Favorable	New water sources and better transportation
Little Impact	No land lost and little competition for water and people
Unfavorable	Land lost to mining and competition for water and people
Very Unfavorable	All mining land now agriculture; conflicts over water; pollution

(2) Tourism/Recreation Will Compete For Land And People

The major land competition for tourism/recreation will be in aesthetics and hunting/fishing. Coal utilization facilities are unlikely to have any direct impacts on tourist/historic sites, e.g. Custer Battlefield Natural Monument. Nor are the facilities likely to become tourist attractions. Strip mining and facility sites could take up lands currently used for hunting and affect fishing streams, cutting the numbers of persons able to participate. The State Fish and Game Department can estimate this impact.

The Old West Region is known as an area of wide open spaces. This feeling, which is attractive to tourists, is likely to be affected by the construction of major industrial facilities and extensive strip mines.

In addition, the coal utilization facilities will compete for the labor supply in the same manner as described above for agriculture.

Very Favorable	--
Favorable	New highways and support activities
Little Impact	Little land lost and strong reclamation/ aesthetic controls
Unfavorable	Land lost for mining and competition for people
Very Unfavorable	Land lost, poor reclamation, loss of streams

(3) Natural Resource Extraction Will Compete Primarily For Poeple

Current utilization of natural resources is primarily in oil production. For the most part, coal areas are not the same areas as those for oil. There will be competition for water, but as for agriculture, oil production should have established rights.

The major competition will be for employees. The coal utilization facilities will require large numbers of highly qualified people. The oil production facilities have them. The likely impact is to raise wages as competition increases. The average wage for skilled operations in oil production may be compared to the average for skilled operations in coal utilization.

Very Favorable	--
Favorable	Improved transportation and stronger tax base
Little Impact	Little competition for water and employees
Unfavorable	Competition for water and employees
Very Unfavorable	Strong competition for land, employees and water

(4) The Nonbase Sector Will Compete For Employees And Sales

The existing nonbase establishments in retail goods and services will have both opportunity and competition. During the construction phase, the new population will rely to a large extent on the existing businesses. Sales will increase and profits should rise. On the other hand, many new job opportunities will open up for current employees, so that present wage scales may have to be raised or employees sought from the households of construction workers.

The steady state period impacts will depend on the actions of current businesses. The need for new retail space has been calculated (See Formula 47A). This can be provided by expansion of existing businesses, increasing sales and profits. If existing business does not respond quickly enough, however, new businesses will move into the community, providing strong competition because of their newness and likely position as part of a larger organization. These new businesses will compete not only for the "added" retail sales but for the present sales as well. This could reduce sales for existing businesses and even put them out of business.

Very Favorable	Existing business able to expand to meet needs at gradual pace
Favorable	Increases in average income and little competiton
Little Impact	Coal employment small percentage of existing
Unfavorable	Wage increases needed to retain employees
Very Unfavorable	Strong competition for employees, great wage increases

A summary of the qualitative impacts on the community can be completed in Exhibit VIII. In the appropriate levels, the research would select the column representing projected impacts based on an assessment of the factors listed after each item in this chapter.

EXHIBIT VIII

Old West Regional Commission

SUMMARY OF COMMUNITY IMPACTS

	Very Favorable	Favorable	Little Impact	Unfavorable	Very Unfavorable
School Costs/Household					
Education and Skill Levels					
Income					
Employment					
Retail Sales					
Housing					
Municipal Property Values					
Quality of Public Service					
Government Finances					
Impact on Agriculture					
Impact on Tourism					
Impact on Other Resource Extraction					
Impact on Nonbase Economy					

APPENDIX A

INTERVIEWS

NEBRASKA

W. Don Nelson Warren White	Director, State Office of Planning & Programming
Dr. E. S. Wallace Vernon Renshaw	Director, Bureau of Business Research, College of Business Administration, Univ. of Nebraska
Dr. Roger H. Hansen	Administrator, School Finance and Statistical and Services Section, Department of Education
Donis N. Petersan Stu Miller	Director of Research, Department of Economic Development
Jack Ruff	Community Services Coordinator, Division of Community Affairs, Department of Economic Development
Gary B. Heinicke Mel Gomez	Senior Research Analyst, Department of Revenue
Mahendra Bansal	Natural Resources Data Bank Natural Resources Commission
Howard Watson	Chief of Research and Statistics, Division of Employment, Department of Labor

SOUTH DAKOTA

Robert Weiss	Senior Planner - State Planning Agency
Ms. Gwen Sibly	Director of Research, Department of Economic and Tourism Development
Charles Saylor	Director, Sales and Use Tax Division Department of Revenue
Michael Denton	Public Utilities Commission, (Assistant to Lee Larscheid, Chief Engineer)

INTERVIEWS
(Continued)

SOUTH DAKOTA (Continued)

Charles Sisk	Director, Public Health Statistics, Dept. of Health
Vern Butler	Executive Director, Natural Resource Commission
Keith Harner	Director, Division of Resource Management Natural Resource Commission
Dick Flemmer	Employment Security Division, Dept. of Manpower Affairs
Blaine Barker	Chief, Water Quality Program, Environmental Protection Agency
Alvin Bies	Assistant Director of Statistical Services Department of Public Instruction
Vincent E. Montgomery (Telephone)	Director, Business Research Bureau, School of Business, Univ. of South Dakota

NORTH DAKOTA

Jack Neckels	Director, State Planning Agency
David R. Torkelson	Director of Research, Business and Industrial Development Department
Wallace Owen	Public Service Commission (Direct Correspondence to E. Bruce Hagen, Commissioner)
Milton Lindvig	Director, Hydrology Division, State Water Comm.
Joe Smith	Chief, Bureau of Reports and Analysis, Employment Security Bureau
Jim Sorenson	Director of Local and Dedicated Taxes, Tax Department (sub. for J. Hulteen)
Willis Van Henvelin	Director, State Department of Health
Rich Blair	Director, Division of Health Statistics, SDH
Jerry Knutson	Environmental Protection Div., SDH (works for Norman Peterson)

INTERVIEWS
(Continued)

Ronald M. Torgeson	Director, Program Planning and Evaluation Department of Public Instruction
Vern Zink	Director, Planning and Research Division, State Highway Department
Dr. Larry Leistritz (Telephone)	North Dakota State University

WYOMING

Don Brunk	Executive Director, Department of Economic Planning and Development
David O. Frendenthal	Economist, DEPAD
James A. Wise	Chief of Industrial Development, DEPAD
Jerry Ertsgard	Housing Specialist, DEPAD
David Ellis	Director of Planning, DEPAD
Charles G. Newton	Coordination, State-Federal Relations
John Farber	SFR
Mark Shirey	Department of Administration and Fiscal Control
Dick Ogara	Department of Labor
Arthur Williamson	Administrator, Water Quality Division Department of Environmental Quality
James E. Petry	Director of Revenue, the Department of Revenue and Taxation
C. James Orr	Supervisor of Appraisals and Equalization Ad Valorem Tax Division (works for Harold De Balt)

INTERVIEWS
(Continued)

WYOMING (Continued)

Frank L. Rauchfuss	Director, Utilities Department Public Service Commission
John D. Warburton	Transportation Planning Engineer, Highway Department
Dr. Roger Hayen (Telephone)	Director Business & Economic Research Univ. of Wyoming

MONTANA

R. Thomas Dundas	Director, Information Systems, Department of Intergovernmental Relations
David Folsum	Chief of Research and Analysis, Division of Employment Security, State Employment Service
Bob Stockton	Department of Public Instruction
Joyce Thompson	" " "
Michael Billings	(Government Operations Unit) Assistant Director, Office of Budget and Program Planning
Dennis Burr	Department of Revenue
Dave Connally	" "
George Pike	Chief Water Resources Division, U. S. Geological Survey
Don Coffin	USGS
Steve Pilcher	State Department of Health
Paul R. Devine	Chief of Planning and Research, State Department of Highways
Lt. Governor Bill Christiansen	
John H. Andrews	Administrative Assistant

APPENDIX B

LIST OF FORMULAE

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